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CHIASMATYPY OR THE DOCTRINE OF DELAYED ACTION FERTILIZATION

By Professor EDWARD C. JEFFREY
HARVARD UNIVERSITY

IN my undergraduate days, I was much interested in the reading of two publications on fertilization, which appeared in the early and late eighties of the last century. One of these dealt with fertilization in the higher seed plants or Angiosperms.[1] In this publication Eduard Strasburger described the fusion of the sperm nucleus, derived from the fertilizing pollen tube, with that of the egg as the essential and fundamental act of fertilization, leading directly to the formation of a new individual. The other gave a much more circumstantial and detailed account of fertilization in *Ascaris megalocephala,* a large parasitic worm found in the intestine of the horse.[2] Here the authors also noted the fusion of the male and female nuclei as an essential and final fact of fertilization. In both cases cited fertilization was regarded as completed by the fusion of male and female reproductive elements.

Towards the end of the nineteenth century the subject of chromosomes began to attract more and more attention. It was early realized that these are characteristic of the active or dividing stages of the nuclei from which they take their origin. Considered to be the main carriers of hereditary influences, they are also important as providing a mechanism for the exactly equal distribution of chromatin between the daughter cells resulting from division. They were also considered to play an important role in fertilization, although its exact nature was not fully understood.

[1] "Befruchtungsvorgang bei den Phanerogamen," Jena, Gustav Fischer; 1884.

[2] Van Beneden et Neyt, Bull. Ac. roy. Belgique, 1887.

A further development of the later nineteenth century, which we also owe to the authors mentioned at the outset, namely, Strasburger and van Beneden, was the demonstration that the cells of the body in the active or kinetic stage of their nuclei contain twice as many chromosomes as the reproductive elements or gametes. The cells forming the transition from the somatic to the gametic condition attracted special interest because they present in division not only half the somatic number of chromosomes but they are of double the somatic volume. These meiotic or reductional chromosomes on account of their size are a favorite and favorable object for the study of chromosomes.

With the beginning of the twentieth century an attempt was made to tie up the chromosomes specifically with fertilization and the transmission of definite characters from the parents male and female and their inheritance in offspring (crossing over). It is a curious fact that little or nothing has been revealed as to the conduct of the chromosomes in the early nuclear phases of syngamy or union of egg and sperm. We have also until very recently been equally ignorant of the organization of chromosomes in the male and female sexual cells or gametes. The whole situation has in fact been extremely confused on account of the relatively minute size of the sexual chromosomes and the difficulties connected with their preservation and study. The electron microscope, by reason of its quite definite limitations from the standpoint of microscopical technique, has afforded little help. There is perhaps reason to hope that the x-ray microscope, which is under patent to the well-known firm of Carl Zeiss of Jena, may help in this direction, if and when it comes into production.

In spite of our actual technical limitations progress has been made in relating chromosomes to hereditary transmission. It has been assumed rather than demonstrated that the chromosomes of the gametes are more simple than the meiotic or reductional ones, which mediate the transition from somatic to reproductive elements (the gametes). The chromosomes of the reproductive cells are supposed to consist of ground substance surrounding a single spiral chromatic thread known as a chromatid. At the time of fusion of male and female elements or gametes, the resulting nucleus is supposed (without any definite proof, however) to maintain intact the chromosomes of both male and female parents. This nucleus becomes the first somatic nucleus and by continued multiplication gives rise to the more or less numerous nuclei and cells of the body. When the reductional or meiotic divisions take place at sexual maturity, the chromosomes of the male and the female origin are supposed to lie side by side and to become locally fused. These hypothetical fusions are the chiasmata of Janssens.[3] After the local fusions have taken place, the fusing gametic chromosomes are supposed to break apart again. This is regarded as the mechanism by means of which parental characteristics are conceived to "cross-over" or undergo chiasmatypy.

It may now be pointed out that in accordance with the chiasmatype hypothesis of Janssens, which has been adopted by many geneticists, fertilization involving the transmission of hereditary characters does not take place with the union of sperm with egg but only at the time of the reduction division or meiosis, leading to the formation of new gametes at sexual maturity of the new individual. Thus in an elm or an elephant true sexual union may take place perhaps only a quarter of a century after egg and sperm have united in the initial stages of reproduction. This assumption seems to demand an extraordinary degree of credulity.

It is not only necessary, apparently, to set aside the chiasmatype hypothesis on the basis of a *reductio ad absurdum* but also by reason of its apparently complete lack of foundation in fact. In this connection we have to consider the hypothesis of homologous somatic chromosomes. It is supposed that the chromosomes of the body occur in like pairs. In each pair one is of maternal origin and the other is derived from the male parent. The hypothesis of paired homologous somatic chromosomes is based on conditions supposed to be exemplified in the two-winged flies or Diptera. Here at the time of nuclear division the somatic chromosomes clearly lie in pairs in the equator of the dividing cell. It is assumed that in each pair one is derived from the egg and the other from the sperm, and that they are homologue derivatives from the opposite sexes. As a result of the study of the cell divisions in the mosquito and blackfly, Diptera with a small number of relatively large chromosomes, it is clear that the pairs of chromosomes appearing in the divisions of the body cells are not homologues but identical twins, since the examination of their course of development shows them to originate from the same mother chromosomes. As a result of the study of favorable material with modern technique, it becomes clear that the hypothesis of homologous chromosomes is without factual basis. Further, there are not structural differences between the various types of chromosomes, since they all are identical in organization. For example, the gametic or reproductive chromosomes have the same organization as the meiotic and the somatic, since they all contain pairs of chromatids. Further, these pairs of chromatids are spirally twined around one another. In other words, all chromosomes, gametic, somatic and

[3] "La Cellule," 1909.

meiotic, present the so-called phenomenon of chiasmatypy, which is palpably absurd. The present writer has emphasized this situation for a decade or more, and some of the younger cytologists at the present time are apparently beginning to reach similar conclusions. The only visible differences among the chromosomes of the diverse categories in the same organism are number and size. The univalent bivalent hypothesis, incidentally, likewise falls to the ground.

The most obvious reason for the general adoption of the chiasmatype hypothesis is its supposed agreement with Mendel's laws of heredity. As a result of crossing, the first or F^1 generation is supposed to be quite homogeneous, that is, composed of essentially similar individuals. It must be admitted that this is often the case. Where the parents are distinct and different species, and also differ in their chromosomal equipment, the F^1 generation often strongly resembles the parent with the larger number of chromosomes. If, for example, *Tradescantia paludosa* (12 somatic chromosomes) be crossed with the pollen of *T. virginiana* (24 somatic chromosomes) progeny closely resembling *T. virginiana* is produced. In other words, the crossing over of the characteristics of the male parent with the larger number of chromosomes has taken place without the intervention of chromosomal meiosis or the supposed chiasmatypy. This is a very general condition in crosses between species and apparently constitutes a very definite negation of the validity of so-called chiasmatypy, as the mechanism of sexual interchange. This subject is reserved for future more extended consideration.

The reader may ask what does take place in fertilization as conceived as the result of investigation with improved technique. Here again we are compelled not only to use good technique, but favorable objects must also be chosen. *Trillium* has shown itself as a very favorable form for the investigation of somatic and gametic chromosomes by reason of the large size of the elements, which favors study with the visual microscope. However, as the present writer has pointed out, the species of *Trillium*, like those of the hawkweeds (*Hieracium*), are apparently quite generally parthenogenetic, and normal sexual reproduction is consequently usually absent. The same situation obtains apparently for the spider lilies (*Tradescantia*), which are frequently employed in cytological investigations; for the present author has frequently seen in various species evidence of parthenogenesis and parthenocarpy. *Lilium* and *Erythronium*, however, are usable objects, although the chromosomal organization is not so clear as in *Tradescantia* and *Trillium*.

Fig. 1 illustrates two stages of the union of male and female gametes in *Erythronium americanum*, the dogtooth violet. The fusing male and female elements both exhibit the presence of chromosomes which contain each two contrariwise spirally wound chromatids. Fig. 2 shows the first division in the fertilized egg. Here the chromosomes likewise exhibit two and only two chromatids. Similar conditions are found in *Lilium*. Further, the meiotic chromosomes are clearly similar in their organization to those of the gametic and somatic categories. It may consequently be assumed that all chromosomes are structurally similar. This condition leaves no room for the univalent bivalent hypothesis of side-by-side union or partial

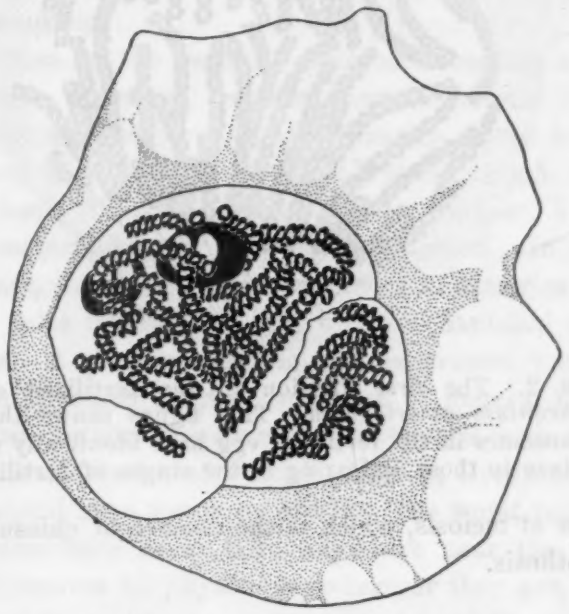

FIG. 1a. Fertilization of the egg in *Erythronium americanum*. At the bottom of the figure is shown the male nucleus; above it lies the female nucleus.

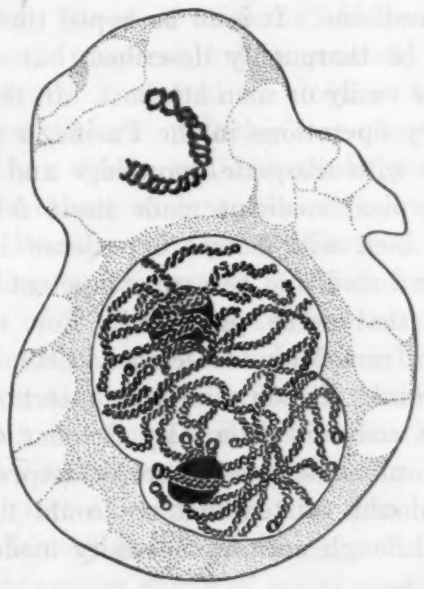

FIG. 1b. Fertilized egg of *Erythronium americanum* at a later stage showing the fusion of the male and female nuclei. In the upper portion is shown part of a chromosome more highly magnified.

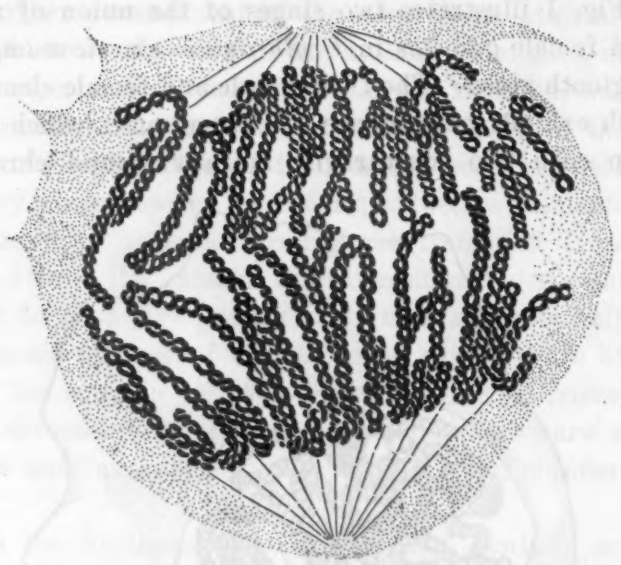

FIG. 2. The first division in the fertilized egg of *Erythronium americanum*. This figure shows that the chromosomes in the fertilized egg have identically similar structure to those appearing in the stages of fertilization.

union at meiosis, which is the essence of chiasmatype hypothesis.

It follows from the various considerations put forward in the preceding paragraphs that the older view —that fertilization takes place at the time of the union of the gametes—accords with the facts. It further follows that all unions of chromosomes are end to end and that parallel or so-called parasynaptic unions do not occur. It may further be remarked that once a chromosome, always a chromosome and that although chromatids can and normally do give rise to chromosomes, the process is an irreversible one since chromosomes do not degrade to chromatids as is assumed in connection with the chiasmatype hypothesis. Moreover, although chromosomes may divide either transversely or longitudinally, they unite only end to end.

The conclusion is reached that the hypothesis of chiasmatypy has no sound basis in fact. Further, since this is the case, the possibility of true sexual union (chiasmatypy) normally taking place long after the junction of the gametes, sperm and egg, is finally excluded, as similarly without basis in fact.

TROPICAL DISEASES AND GEOPATHOLOGY

By Colonel FRANCIS R. DIEUAIDE, M.C., A.U.S.
CHIEF OF THE TROPICAL DISEASE TREATMENT BRANCH IN THE OFFICE OF THE SURGEON GENERAL[1]

IT was a foregone conclusion that, in the great war which has just been brought to a successful end, our Army would suffer from tropical diseases and would have dire need of doctors with sound knowledge of tropical medicine. It is to be hoped that the experience will be thoroughly described, but such an end will not be easily or soon attained. In the early days of military operations in the Pacific, a great dearth of officers with adequate knowledge and understanding of tropical medicine made itself felt. As time went on, men with sound experience in basic pathology and medicine became competent to solve the problems that were presented. For malaria, the transition from May to October, 1943, contained a turning point. In May, all was uncertainty, lack of confidence and confusion. By October, skill, understanding and orderliness were widespread. In the interval, doubt existed that we could fight in New Guinea, although military necessity made it imperative to do so.

When it became possible to mobilize effectively skilled personnel available to put to work on tropical disease problems, the Army found that it had at its disposal a moderate number of experts in preventive medicine, a very limited number of experts in laboratory diagnosis and hardly any in the clinical field. It was necessary to use a large proportion of available experienced personnel as instructors in "hurry-up" courses which had to be organized to meet the emergency. This experience brings into sharp focus the fact that American medical schools, in spite of exceptional instances to the contrary, on the whole have neglected the so-called tropical diseases, especially their clinical aspects. We have not solved some of the important problems which this group of diseases presents in the United States, notably not in the case of malaria. Although we can be justly proud of our sanitary achievements in Puerto Rico, Panama and the Philippines, our close association with those tropical regions has had relatively little influence upon American medicine.

As for the future, it should not be supposed that our present security from potential world threats in the form of exotic diseases will always be maintained with ease. Preventive medicine has not yet abolished any disease. The price of health security is eternal vigilance. In this connection, we should take note that whatever course American political relations may take with the other American republics and the Far East, our commercial and cultural relations with the peoples of those parts will constantly increase in volume and in intimacy. The health problems of our neighbors to the South and West across the Pacific are bound to be matters of great concern to us.

From the scientific point of view, it is notable that our knowledge of the immunology, the pathologic

[1] On leave from the Harvard Medical School and the Massachusetts General Hospital.

physiology, the course and the correlation of the course with the pathology of most tropical diseases is superficial and fragmentary. So is our knowledge of methods of diagnosis and treatment. Modern methods of study have hardly touched these problems, especially those that require clinical investigation. To some extent, these great lacunae exist in our knowledge because of failure to bring together the qualified personnel, the necessary facilities and the living material to be studied. The deficiencies are due in large part, however, to lack of stimulation and interest to attack such problems.

Experience shows that such problems can be attacked in many ways. One method is through the establishment of tropical institutes devoted specifically to this set of problems. Such institutes, however, have small influence on general medical education and are apt to work in fields remote from practical medicine. For these reasons alone, it is desirable that some of our medical schools (but by no means all) should take up the problems of tropical diseases without separating them unduly from general pathology, immunology and clinical medicine. The study of these diseases will profit enormously from intimate intermingling with studies of other diseases in the realm of internal medicine. At the same time, some at least of our medical students will acquire an adequate basic knowledge of tropical diseases. Intending specialists can continue to work in medical schools which devote serious attention to this field or betake themselves to special institutes.

The existence of "tropical diseases" as a group rests on the historical basis that modern medicine developed in Western Europe and North America. In regions where these diseases occur naturally, it is absurd to set them apart from general medicine. Yet this is often done. Tropical diseases are the stock in trade of India and China, for example. Moreover, there are in fact few truly tropical diseases. The classification of potentially worldwide diseases, such as cholera and plague, as "tropical" is dangerous, since it may result in widespread ignorance of their nature and general lack of skill in their control. Among the diseases commonly labelled "tropical" is malaria. As a result American medical students know little about this important American disease. Malaria owes its slender claim to the designation "tropical" mainly to social and economic conditions. The relapsing fevers are tropical only in small part. Even in the case of kala-azar, it is notable that Peiping, China, in latitude 42° North, is one of its great centers. Beriberi is often classed as a tropical disease, presumably because it has been extensively studied in the Netherlands East Indies and elsewhere in the Far East. Yet no fundamental linkage has been demonstrated between beriberi and the tropics. Surely no American physician should think of undulant fever as tropical. As for dysentery, when one considers its history in the United States, the ignorance of temporary Army medical officers in World War II concerning both amebic and bacillary forms is shocking.

When, as the result of social amelioration and preventive measures, certain diseases become rare in Western Europe or North America, there is a tendency to call them "tropical," even though there is no basis whatever for such a designation. The case of malaria has already been mentioned. In this instance, the designation "tropical" in America carries the false implication that we have banished the disease. A glaring example of this process was found in a standard English text-book of general medicine whose author classed epidemic typhus with tropical diseases (shades of Pringle, Hewitt, Bretonneau and Gerhard have mercy on him!). The worst ravages of typhus have never been anywhere near the tropics. It behooves all physicians, wherever they are, to consider the occurrence of one or more forms of the rickettsial diseases to be well within the possible bounds of their experience.

The confusion of thought on these matters is associated with vague notions as to what constitutes the "tropics." For example, although often loosely associated with the tropics (at least in this connection), China is tropical or even subtropical only in relatively small part and Japan proper to a still less extent.

The term "tropical medicine" is convenient and serves certain purposes, but as generally used it does not correspond to a field of medicine that rests on any serious etiologic, pathologic or clinical principle. It has only a feeble and inaccurate geographic significance, meaning at best diseases not now common in either Western Europe or North America (and often failing to stay within this definition).

In spite of all this, there are fundamental concepts and problems which are adumbrated in tropical medicine. These are the peculiarities of disease in relation to topography, climate and the distribution of pathogenic and disease-transmitting organisms. Such subjects are part of pathology and also part of that aspect of biology known as ecology. Inter-related in many ways are the effects of social conditions as they occur in various regions, of regional food habits and food supplies, and perhaps of hereditary racial traits. The peculiarities of tropical diseases and the subject of tropical medicine are fragmentary portions of this great field, the significance of which far transcends that of any selected group of specific diseases.

Unfamiliar terms are always objectionable. Nevertheless, a new and important field calls for a dis-

tinctive and adequate name. Perhaps the term "geopathology" is the best that can be found to designate the subjects under discussion.

Brief reflection shows that geopathology, as here defined, is a subject of great practical and scientific importance. Studies in this field should be concerned not only with specific diseases (and *a fortiori* not only with specific parasites), but with regional peculiarities of all diseases. The peculiarities in certain areas of pneumococcus pneumonia, tuberculosis and rheumatic fever, though yet poorly known, are striking and suggestive. Moreover, the field is not limited to communicable diseases, but extends in all directions. For example, glimmerings exist of regional peculiarities in diabetes, bladder stones, hypertensive disease and cancer. In spite of the importance of studies in this field, both for the advancement of knowledge and for the prevention, control and treatment of disease, geopathology is in its infancy. There is no even moderately comprehensive treatise of existing knowledge of the subject. Presumably, such a work today is hardly worth the effort, in view of our fragmentary information and understanding. Adequate study and discussion of diseases in many important parts of the world have not yet been accomplished.

In the years to come, Americans will be looking especially in two directions, to the South and to the Far East. We will quickly build up and long maintain intimate relations with the peoples of those regions. Their health problems, which are vastly different from those we now have, will become in a measure our problems. American medicine should lead in the elucidation and solution of the problems of geopathology. It should do so without delay and with enthusiasm.

OBITUARY

HENRY BALDWIN WARD

THE sudden and unexpected death of Henry Baldwin Ward on November 30, 1945, brought to a close a truly remarkable career. Few scientific men have ever enjoyed a life of such intense and long-continued activity, which was kept up almost to the day of his death. In fact, one of his former students visiting him in his office at the end of October of this year found him busy breaking in a new secretary, while in the midst of finishing up an article that was due to go to the printers in a few days. His broad interests and unusual ability made it possible for him to take part in a wide variety of activities. He took pride in lecturing to freshman zoology classes. He trained a large group of graduate students. He carried the heavy administration duties of a large university department while taking part in general university and community life. He contributed important researches in parasitology and a variety of other zoological subjects and wrote numerous popular articles. He also found time to take a leading part in the development of scientific organizations, including the American Microscopical Society, the Society of Sigma Xi and the American Association for the Advancement of Science. He was also interested in a variety of national projects including wild-life conservation and stream pollution.

Henry Baldwin Ward was born in Troy, N. Y., on March 4, 1865. He received the A.B. degree at Williams College in 1885 and was employed as a teacher of science in the high school in Troy from 1885 to 1888. This was followed by one of the most fruitful periods of his life when from 1888 to 1890 he studied at the Universities at Göttingen, Freiburg and Leipzig and spent his summers at the marine biological stations at Naples, Heligoland and Ville-Franche-sur-Mer. At Leipzig he worked in the zoological laboratory of Rudolph Leuckart, who was then at the height of his career. It was here that he realized the possibilities of the field of parasitology, and determined to establish a graduate laboratory in this subject in the United States.

After returning to the United States in 1890 Dr. Ward undertook graduate studies under Professor E. L. Mark at Harvard, and completed his thesis for the Ph.D. in 1892. His first university position was that of instructor in zoology in the University of Michigan from 1892 to 1893. Soon after this he undertook biological studies for the Michigan Fish Commission on the Great Lakes, and for a number of years worked on a biological survey of the Great Lakes for the U. S. Fish Commission. Early in these investigations he started his collection of parasitic worms, which continued to grow throughout his whole life.

In 1893 Dr. Ward was called to the University of Nebraska as associate professor of zoology. He was promoted to professor in 1899 and became head of the department of zoology in 1906. At Nebraska he became interested in premedical and medical education, and served as the dean of the medical school from 1899 to 1909. Soon after his arrival in Lincoln he met Harriet Blair, who was teaching in the music school of the university. They were married on September 11, 1894, and celebrated their golden wedding anniversary in 1944. Mrs. Ward and their two daughters, Cecelia and Charlotte, survive him. At Nebraska he found the opportunity to train a small number of graduate students in parasitology and to

make a beginning in the realization of his dream of developing a graduate laboratory in this subject. His relation to the medical school turned his attention to the parasites of man, and he published a series of papers on human parasites in the Studies from the Zoological Laboratory of the University of Nebraska of which he was the editor. It was during this period that he reported for the first time the presence of the human lung fluke, *Paragonimus,* in the United States, and started his series of publications on the parasites of fresh-water fish.

In Nebraska, also, Dr. Ward became interested in the Society of Sigma Xi. He joined this organization in 1897 as a charter member of the Nebraska Chapter, which was installed in June of that year. In 1904 he was chosen as corresponding secretary of the society, and from that time until 1928 his name was among its national officers. He was national secretary for eighteen years, president for two years and for twenty-five years was a member of its executive committee. He also edited the publications of the organization during this period, including the *Quarter Century Record.* To his efforts in those critical years is largely due the present effective organization of Sigma Xi and the high position that it holds in educational and scientific circles. From 1898 to 1904 he also served as secretary of the American Microscopical Society, and was its president in 1905. This society also owes him a great debt for guiding its destinies during a very critical period.

In 1906 he started his investigations on the Alaska and Pacific salmon which were continued throughout most of his life. These investigations gave him the opportunity not only to make important scientific contributions, but also made it possible for him to spend many of his summers in the field. He was a true outdoor man, and his greatest relaxation came from following the migrations of the Pacific salmon through some of the wildest country of the Pacific Northwest and Alaska.

In 1909 Dr. Ward was called to the University of Illinois as professor and head of the department of zoology. He came at a very propitious time, since the university was just embarking on an extensive program for the development of its graduate school. Here he was able to realize his dream of organizing a strong research laboratory for graduate work in parasitology. Support was available for assistantships and fellowships for graduate students, and from that time until his retirement in 1933 he sent out a constant stream of men trained with the Ph.D. in parasitology. Every possible facility was given to his graduate students. They had easy access to his extensive reprint library. He encouraged the more experienced men to help the beginners, and was constantly on the alert to attract able students to his laboratory. He always considered his students as real members of his family, and after they graduated helped them in every possible way to get suitable positions. In fact, in his later years he found his greatest pride and joy in the achievements and success of his students. Dr. Ward and his numerous students have had a great influence on the development of parasitology in the United States. He can truly be called the Father of American Parasitology, or perhaps better still in recent years he became its grandfather, since the men trained by his students now represent the largest and most active group in this field.

During the busy years at Illinois he always found time to push his personal researches and writing. Special mention should be made of the publication in collaboration with Whipple of the "Freshwater Biology" in 1917. This book has been of great value to a host of workers in biology and shows the breadth of Dr. Ward's biological interests.

Early in the development of his graduate group Dr. Ward realized the need of better facilities for publication of research in parasitology in the United States. He, therefore, persuaded the university to start the Illinois Biological Monographs in 1914. This series has made possible the publication of the results of a large number of fundamental and extensive investigations in parasitology and other biological fields. In September of this same year there also appeared the first number of the *Journal of Parasitology.* It certainly took courage, optimism and confidence in the future to launch an American journal in parasitology at that time. Active research workers in the field were few, and Dr. Ward's own laboratory was practically the only center in the United States for graduate training in this subject. In fact, there was little evidence of the recognition of parasitology as a separate field. It seemed doubtful if there would be either sufficient contributors or subscribers for a journal of this type. The success of this journal in its early years was due almost entirely to Dr. Ward's untiring efforts. The outbreak of the first World War added greatly to his difficulties. From 195 for volume 1 the number of subscribers steadily increased until a peak of almost 600 was reached for volumes 16 to 18. After the organization of the American Society of Parasitologists in 1925 with Dr. Ward as its first president, a committee was appointed to consider the possibility of making the *Journal of Parasitology* the official organ of the society. By 1931 this society had grown to a membership of 550, and in 1932 Dr. Ward presented the *Journal of Parasitology* to the society. This journal is now in its thirty-first volume and has over 1,000 subscribers. It bears

on its cover the statement "Founded by Henry Baldwin Ward," which is a fitting reminder of the personal efforts of the founder which kept the journal alive in its early years.

At Illinois Dr. Ward soon became a real influence in university affairs. He was one of President James's right-hand men, and at one time lobbied in the legislature in favor of increased university appropriations. For many years he lectured to the freshman classes, and took personal charge of the organization of Zoology 1. Each year he gave advanced lectures to his large group of graduate students and actively directed their researches. He also was always in demand for a variety of university committees. He was a member of a large number of scientific societies and was active in them all. He was frequently called upon for outside lectures and many honors were conferred on him, including honorary membership in a number of foreign scientific societies and academies and honorary degrees from institutions in this country.

Dr. Ward was always interested in conservation of natural resources and in stream pollution and in his later years devoted much of his time to these problems. In 1925 he became a member of the national executive committee of the Izaak Walton League of America and from 1928 to 1930 served as the national president of this organization. Another of his interests was in the development of the American Association for the Advancement of Science. In 1901 he was secretary of section F, in 1903 he was its general secretary and in 1905 its vice-president. After his retirement from the University of Illinois he served as the permanent secretary of the A. A. A. S. from 1933 to 1937, spending much of his time in Washington, and from 1937 to 1941 was a member of its executive committee. He had a large part in the splendid development of this organization during recent years.

Dr. Ward always had a wide circle of personal and scientific friends. He loved to play baseball and to go on hikes with university friends on Saturday afternoons. His enthusiasm, varied experience and broad interests made him a stimulating and charming companion. His passing will be widely noted, and he will be sorely missed by his students, his university colleagues and his numerous friends and acquaintances in this country and abroad.

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SCIENTIFIC EVENTS

FEDERAL SCIENTIFIC RESEARCH

MANY scientists will object to the last line of the second principle of the recommendations of the Board of Governors of Yale University on "Federal Support of Scientific Research," published in SCIENCE for November 23:

> The body responsible for the administration of federal support should be completely free from political control and should select its own executive officer. Men chosen for this task should be of the highest scientific reputation and enjoy the confidence of scientists generally. It is desirable that the National Academy of Sciences, which was established to advise the Government on scientific matters, should present in nomination a panel of names from which the members of the administrative body would be appointed.

An alternative method for the distribution of these funds has also been suggested; namely, that a committee selected from a panel of names approved by the National Academy of Sciences, or other accredited body, should have control over the distribution of about fifty per cent. of the funds, while the other fifty per cent. should be distributed equally among the forty-eight states. The distribution of these funds should be controlled by committees selected by popular vote of the academy members at the annual meeting of the State Academy of Science, or other scientific organization which may be selected and which is nationally recognized in the state, and, furthermore, that the fund for each state should be a rotating fund so that every academic institution within the state wherein scientific work is being done by investigators who have already published articles in scientific journals of national circulation, shall participate in these benefits for the perpetuation of which every citizen is to be taxed. Wide distribution of funds should be made and these should not be given to a selected few, who in the past and future have received and will continue to receive large grants from the Rockefeller and other foundations. We suggest that, if the reader agrees with this proposal, he write to Senators Magnuson and Kilgore as soon as possible endorsing this principle.

R. G. ROBERTS
H. H. BEARD
THE CHICAGO MEDICAL SCHOOL

THE WAR REPRINT SERVICE OF THE JOSIAH MACY JR. FOUNDATION

DR. WILLARD C. RAPPLEYE, president of the Josiah Macy Jr. Foundation, announces that more than five million copies of over four hundred leading medical and scientific articles have been published by the foundation's War Reprint Service during the last three years for medical officers of the armed forces of the United States and in so far as possible Canada, England, New Zealand, Australia, the Union of Soviet

Socialistic Republics and China. Dr. Rappleye stated that with the plans for demobilization of the armed forces the reprint service will be discontinued by January first.

The reprint service of the foundation has been an effort to bring new and important developments in the science and practice of medicine to medical officers who were largely cut off from the sources of medical information during the war. In the selection of these articles the foundation has had the active cooperation of the Committee on Pathology of the National Research Council and of the National Committee for Mental Hygiene. The articles selected for reprint and distribution were those dealing with the most recent scientific developments that had a direct bearing on medical and health problems related to military service. The distribution to the medical officers was worked out in cooperation with the Surgeons General of the Army and Navy and the Air Surgeon. Through the courtesy of the National Committee for Mental Hygiene, more than one million reprints were delivered to neuropsychiatric medical officers.

In addition to the articles reproduced from journals the foundation has published for the Air Surgeon five original monographs, prepared by medical officers of the Army Air Forces, dealing with personality disturbances occurring in combat zones. Over 95,000 copies of these monographs were distributed by the reprint service as official documents of the Office of the Air Surgeon. Eight additional monographs and nine reviews of medical literature on subjects of military interest have been prepared and 70,000 copies distributed. Since August, 1944, a News Letter for the Rheumatic Fever and Streptococcus Control Program of the Army Air Forces has been published monthly for the Air Surgeon, and over one thousand copies each month have been mailed to interested medical officers, military hospitals and medical school libraries. Through the cooperation of the Interdepartmental Committee on Cultural and Scientific Cooperation of the Department of State, sixty thousand reprints have been distributed to medical teachers and investigators in forty-eight foreign countries. The Office of War Information requested permission to circulate the reprints of the foundation among more than thirty of their foreign outposts, and has reduplicated selected articles for their distribution to medical leaders abroad.

An expenditure of over $225,000 has been made by the foundation in financing the War Reprint Service.

GRANTS OF THE NUTRITION FOUNDATION

AT a meeting, on November 8, of the Board of Trustees of the Nutrition Foundation, grants were made as follows:

Stanford University, $5,000 for a two-year study of the distribution of body protein under changing conditions.

Yale University, $5,000 for a two-year study of the chromatographic adsorption analysis of fatty acids and carbohydrates.

The University of Wisconsin, $10,500 for a three-year study of the effect of dietary components on the requirement of amino acids.

The University of Toronto, $8,000 for a two-year study of the relation of carbohydrates to inositols.

Tulane University, $4,250 to study nutritional anemia in man.

The University of California, $2,400 for a two-year study of the metabolism of amino acids in the chick.

Pennsylvania State College, $10,000 for a two-year study of spectrographic methods of estimating vitamin A and provitamin A.

Cornell University, $7,000 for a two-year study of the function of essential nutrients.

Duke University, $4,000 for a two-year study of fatty livers and choline deficiency in the guinea pig.

Northwestern University, $12,000 for a two-year study of the human requirements of niacin and related nutrients.

Renewals of grants previously approved included the following:

Cornell University, $5,600 to continue studies on the metabolism of proteins.

Meharry Medical College, $850 to continue studies on pantothenic acid metabolism.

Harvard University, $12,265 to continue research on nutrition education in the public schools.

Duke University, $3,600 to continue studies on paralysis in dogs on a B-complex deficient diet.

The University of Southern California, $3,000 to continue studies on the intermediary metabolism of carotene.

Washington University, $14,300 to continue studies on the mechanism of carbohydrate reactions in animal tissues.

GRANTS OF THE COMMONWEALTH FUND

DIRECTORS of the Commonwealth Fund, of which Malcolm P. Aldrich is president, have appropriated the sum of $304,000 for public health activities in Tennessee, Oklahoma and Mississippi; $204,000 for medical research, and $121,000 for medical education.

Among the research grants were one for the study of arthritis at the Harvard Medical School and another for research in kidney and vascular physiology, with special reference to hypertension at the New York University College of Medicine.

A grant of $57,000 was made to Cornell University Medical College to establish a new clinic where physicians can be trained in a broader medical service than is now available, and $40,000 was granted to the Medical College of Virginia to initiate post-graduate educational services in eastern and southeastern Virginia.

The Commonwealth Fund fellowships for British

students, first offered in 1925 and interrupted in 1941 by the war, will be resumed next spring, when the British Committee of Award will be invited to nominate twenty fellows for 1946.

THE PERMANENT SCIENCE FUND OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES

INCOME from the Permanent Science Fund, by agreement and declaration of trust, is disbursed by the American Academy of Arts and Sciences in support of scientific research in the fields of mathematics, physics, chemistry, astronomy, geology, geography, zoology, botany, anthropology, psychology, sociology and economics, history and philology, engineering, medicine, surgery, agriculture, manufacture and commerce, education or any other science of any nature or description.

Applications for grants-in-aid are receivable on multiple forms which will be supplied upon request to the chairman of the committee, and are considered by the Permanent Science Fund Committee of the academy on March 1 and October 1.

It is stipulated that title to equipment purchased outright from a grant from the Permanent Science Fund resides in the fund, such purchased equipment being subject to reassignment by the committee, upon termination of research in the particular field of endeavor in support of which a grant is made.

It is further a condition of grants made by the academy from the Permanent Science Fund that they are not for financial support of work the results of which comprise partial fulfillment of requirements for an academic degree.

It is a policy of the committee not to approve requests for general permanent equipment for institutions.

Disbursements will be made upon authorization of the academy by its treasurer directly to recipients, as named in the awards, and not to institutions with which recipients may be affiliated. Annual accounting for expenditure of these funds is required as a condition of the grant, and the committee appreciates being informed of the state of progress of projects supported and the manner in which grants have been utilized.

Address communications to John W. M. Bunker, *chairman,* Permanent Science Fund Committee, Massachusetts Institute of Technology, Cambridge, Massachusetts.

NEWS FROM ABROAD

LETTER FROM DR. A. CH. RUYS

DR. ALFRED COHN, chief of the division of venereal disease research of the Department of Health of the City of New York, has received the following letter, dated September 19, 1945, from Dr. A. Ch. Ruys, bacteriologist at the University of Amsterdam:

Now that the war is over, I am glad to be able to resume relations with the laboratory workers abroad.

As you know our country suffered very much. We had to stop much of our work this winter, because we had no more gas and electricity. I succeeded in keeping the most valuable things alive in an incubator heated with butagas. The autoclaves were heated on small stoves and with the help of some methylated spirit we kept things going.

We are now very eager to be informed about progress in scientific work abroad. If you have reprints to send me I should be very grateful. Perhaps you could ask other bacteriologists to send reprints to help us.

We are very thankful for the help of the allies. The food rations are now sufficient; we only get very little albumen, the meat, milk and cheese rations being very low, but everybody is improving much in body-weight. We hope coffee and tea are coming soon.

LETTER FROM DR. R. H. STETSON, OBERLIN COLLEGE

Word has been received that the sudden appearance of American troops saved Professor Emil Utitz and his wife from a final massacre at the Terezin Concentration Camp, where they had been confined for three years. He was professor at Halle and Prague and editor of the *Archiv für Charakterologie.* Professor Utitz is now in Prague; Na Vaclavce, No. 35, Pracha, XVI, Czechoslovakia.

LETTER FROM SIR EDWARD BAILEY

Dr. Eliot Blackwelder, of Stanford University, has received a letter from Sir Edward Bailey, formerly director of the Geological Survey of Great Britain, in the course of which he makes but scant mention of his own achievements in the past five years, saying only: "My own highlights have been a six weeks' trip to Malta in 1943 to help water supply, and being buried by a V-1. Fortunately the others [members of his family] were all out at the time." Later he adds: "Times are difficult but far from hopeless. At the backs of our minds we have the good and the harm that lurk in atomic energy."

LETTER FROM DR. A. F. HOLLEMAN

THE following letter has been received by Dr. Marston Taylor Bogert, of Columbia University, from Dr. A. F. Holleman, of Bloemendaal, Holland:

It is very kind of you to ask me how I have passed through the ordeal of the Nazi occupation. I appreciate it very much. The principal thing I can anwer is that I live still and am 86 years old. We here in Holland had a very bad time in the last year of the Nazi regime: hunger, notwithstanding the disinteresting supply of food of foreign nations, also by the U.S.A.; no gas, no electricity, great dearth of fuel; driven out of our

houses; continuous fear for new vexations by the Huns. It was a horrid time.

What belongs to me personally, I had to leave my house in September, 1944, and was still four times obliged to remove. During the time that my house stood empty German and other thieves had been in it and have stolen much, though I had packed up most of my furniture; but in the hurry in which we were obliged to remove it was impossible to pack up all. Just a month before the deliverance twelve Huns were lodged in my house and left it in a state of dirtiness not to describe.

But the worst of all was that I lost my dear wife in December by an accident. This summer I have been very ill, but now my health is again gratifying, regarding my high age.

You do not write how you are yourself and your family. I hope that they and you are in good health. With my kindest regards to my American friends.

LETTER FROM DR. LOUIS HENRY

Dr. L. Morton, associate professor of electron optics at Stanford University, writes, under the date of December 7, that he has just received a letter from his friends, Dr. and Mrs. Louis Henry, of Brussels, Belgium. As part of this letter may be of interest to many American scientists, he has made a résumé of part of it, originally written in French:

The Belgian "Fonds National pour la Recherche Scientifique" has been split in two. The old Fonds National will be, in the future, more specifically devoted to scientific research only and the more industrial research is handled by a new institution called "Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture." The first institution remains under the administration of Dr. Jean Willems. For the director of the second institution, originally Mr. Pierre Beghin was selected. He died suddenly, however, and will be replaced by Dr. Louis Henry as new director. Dr. Henry, up to recently, was professor of physics at the School of Agriculture in Gembloux and research associate of the "Fondation Medicale Reine Elizabeth." During the war, both he and his wife were taken prisoners by the Germans for underground activities, and they spent over two years in German concentration camps. Mrs. Henry is attached as research associate in chemistry to the Fondation Medicale Reine Elizabeth.

The same letter also contains news about several other Belgian scientists, among them Drs. Desclin and Cosyns, of the Fondation Medicale Reine Elizabeth, who are well, and Professors Marchal Hoffmann, Piccard and Kipfer at the University of Brussels. All are well with the exception of Mr. Marchall, who is at present in a sanitarium in Switzerland, recuperating from the after-effects of long imprisonment in Germany.

SCIENTIFIC NOTES AND NEWS

DR. WILLIAM DAVID COOLIDGE, formerly vice-president and director of research of the General Electric Company, who is now touring South America, has been awarded the "Orden al Merito" of the Chilean Government. The award was conferred at a reception at the University of Chile in Santiago, tendered by the faculty of medicine and the faculty of physics and mathematics. As Dr. Armando Larraguibel, dean of the Faculty of Medicine, placed the jewel of the order around Dr. Coolidge's neck, he said: "The scientists of Chile have delegated me to give you this jewel, which is made of the gold of the Chilean mountains and by Chilean hands, and it represents the kindest love of the Chilean people." Dr. Larraguibel and Señor Pablo Krassa, dean of the Faculty of Physics and Mathematics, presented him with a diploma as honorary member of their faculties. He also received an honorary diploma from the Catholic University, and was made an honorary member of the Chilean Radiological Society.

THE "Arnold Reymond Prize, Foundation Ch.Eug. Guye," endowed by the late Ch.Eug. Guye, professor of physics at the University of Geneva, has been awarded for the first time to Dr. Lecomte du Noüy for his three last books on biological time and on evolution. The prize was founded by the University of Lausanne, Switzerland, to be awarded for the best work on the philosophy of science in the course of ten years.

PROFESSOR HOYT G. HOTTEL, director of the fuels research laboratory of the Massachusetts Institute of Technology, is the recipient of the William H. Walker Award for 1945 of the American Institute of Chemical Engineers for his paper prepared in 1942 on radiant heat transmission from water vapor. The award is made annually by the institute to the member who has made the most valuable contribution to chemical engineering literature over the three years prior to its presentation.

THE Robert J. Collier trophy of the National Aeronautical Association, awarded annually to the American making the "outstanding contribution to aviation," has been conferred on General Carl A. Spaatz, commander of Strategic Air Forces in Europe and the Pacific, in recognition of his efforts in "demonstrating the air power concept through employment of aviation in the war against Germany."

SIR ROBERT ROBINSON was elected president of the Royal Society, London, on November 30, at the two hundred and eighty-third meeting and dinner of the society.

THE Walter Reed Medal of the American Society of Tropical Medicine has been awarded to the Federal Government of Brazil in recognition of the "invaluable work" accomplished in the sphere of preventive medicine.

AN expansion of the curriculum in geology has been announced by Indiana University under an arrangement whereby the department of geology will conduct the work of the State Division of Geology. New courses will include non-metals, mineralogy, petrology and petrography, and areas of study determined by war experience to be important as an aid to industry. Dr. Charles F. Deiss is chairman of the department of geology and director of the State Division of Geology. Dr. Eugene Callaghan, commodity geologist of the U. S. Geological Survey, has been appointed professor of economic geology at the university, and Dr. George T. Faust, associate mineralogist of the survey, has been appointed professor of mineralogy. Both will serve on the staff of the State Division of Geology.

DR. RALPH LINTON, professor of anthropology at Columbia University and head of the department, has been appointed Sterling professor of anthropology at Yale University.

DR. LYMAN E. JACKSON, secretary of the National Association of Land Grant Colleges and Universities, president of South Dakota State College of Agriculture and Mechanical Arts, has been elected dean of agriculture at Pennsylvania State College.

DR. HAROLD C. BOLD, formerly on the faculty of Barnard College, Columbia University, and more recently a lieutenant commander in the Navy, has been appointed associate professor of botany at Vanderbilt University. Dr. Fred T. Wolfe, who has been on leave from his position as assistant professor of botany for the past three years for duty in the Army, will return in January.

PROFESSOR MARCEL K. NEWMAN, a member of the department of aeronautical engineering of the Polytechnic Institute of Brooklyn, has been appointed associate professor of mechanical engineering in the College of Applied Science of Syracuse University.

DR. WILLIAM B. WENDELL, associate professor of chemistry of the College of Medicine and of the School of Biological Sciences of the University of Tennessee, has been appointed professor and head of the department of biochemistry at the School of Medicine of Tulane University, New Orleans.

DR. STUART MCLAIN, Lieutenant Colonel and chief of the Arms and Ammunition Division of the Research Development Center at Aberdeen, has been appointed professor and head of the chemical engineering department of the College of Engineering of Wayne University.

DR. KURT G. STERN has become professor of biochemistry at the Polytechnic Institute of Brooklyn. In that capacity, he will continue to teach courses on physical methods in biology and medicine in the Graduate School and to direct research on biochemical problems in the newly established High Polymer Research Institute, the director of which is Dr. Herman F. Mark.

CAPTAIN CHARLES G. WILBER, aviation physiologist, Air Corps, has been released from active service and has joined the faculty of Fordham University.

DR. RICHARD W. DODSON, recently of Los Alamos, has been appointed assistant professor of chemistry at the California Institute of Technology. He will carry on a program of research in nuclear chemistry.

DR. JOHN D. FERRY has been appointed assistant professor and research associate at the University of Wisconsin. He will conduct research and give courses on high polymers. Dr. Ferry is now engaged on war research at the Harvard Medical School and at Woods Hole. He will take up his new work on January 21.

DR. ROUSSEAU H. FLOWER has been appointed assistant state paleontologist in the New York State Science Service and the New York State Museum. Since September 1, 1944, he has been a member of the staff of the office of the state paleontologist. He held an instructorship at Bryn Mawr College during the school year of 1943–1944.

DR. JACINTO STEINHARDT has been appointed director of research of the operations evaluation group attached to the Office of the Chief of Naval Operations under a contract between the Navy and the Massachusetts Institute of Technology. Dr. Steinhardt, whose research on proteins was formerly carried on at the National Bureau of Standards, became affiliated with the operations research group of the Navy soon after its formation. During the war he worked with this group in Washington, and overseas in the South Atlantic and in the Southwest Pacific areas.

JAMES C. LEARY, science editor of the Chicago *Daily News*, has resigned to become research associate with Lawrence C. Salter and Associates, consultants for science, Chicago and New York. Mr. Leary will make his headquarters at the home office of the organization in Chicago.

DR. J. S. H. DAVIES, formerly of the Imperial Chemical Industries, Ltd., London, has become director of research of the British Schering Research Institute in succession to Professor D. H. Hey, who was recently appointed professor of chemistry at the University of London.

DR. HERMAN SHAW, keeper in the Science Museum, London, has been appointed director and secretary of the museum in succession to Colonel E. E. B. Mackintosh, who retired on November 30 at the age of sixty-five years. He had been director of the museum since 1933, when he succeeded Sir Henry Lyons.

DR. JACQUES ROUSSEAU, director of the Montreal Botanical Garden, has returned from Mexico where he lectured during a month at the Institut Français d'Amérique Latine.

DR. WILLIAM A. MOSHER, head of the department of chemistry of the University of Delaware, addressed the Philadelphia Organic Chemists' Club on November 29 on "Recent Advances in Terpene Chemistry." At a dinner preceding the regular meeting, Dr. Edward H. Cox, professor of organic chemistry at Swarthmore College, gave an account of his recent experiences in Europe. Dr. T. F. Lavine, a charter member of the club, presided on both occasions.

A SERIES of six lectures on "Genetics, Medicine and Man" under the Messenger Lecture Foundation were given at Cornell University on November 26 and 28, and December 3, 5, 10 and 12. Dr. Herman J. Muller, formerly of Amherst College, who was recently appointed professor of zoology at Indiana University, spoke on "The Work of the Genes," and "The Dance of the Genes." Dr. Clarence C. Little, managing director of the Society for the Control of Cancer and director of the Jackson Memorial Laboratory, spoke on "The Nature of Parental Influence," and "Growth and Individuality" and Dr. Laurence H. Snyder, professor of medical genetics and chairman of the department of zoology at the Ohio State University, spoke on "Human Heredity" and "The Mutant Gene."

PROFESSOR GREGORY BREIT, of the University of Wisconsin, on December 10 gave two graduate lectures at the University of Iowa. These were on "Forces Between Nuclear Particles" and "Resonances in Nuclear Reactions."

SIR HAROLD HARTLEY, F.R.S., delivered the first Armstrong Memorial Lecture before the Society of Chemical Industry at the Royal Institution on November 21. He spoke on the part taken by Henry Edward Armstrong in the development of technical education in Great Britain and in the establishment of the City and Guilds Central College as a center of scientific activity. The president, Professor E. K. Rideal, presided.

THE American Association of Anatomists will hold its regular annual meeting in Cleveland, Ohio, at the invitation of the School of Medicine of the Western Reserve University, on April 4, 5 and 6, 1946.

THE twelfth annual chemical engineering symposium of the Division of Industrial and Engineering Chemistry of the American Chemical Society will be held at the Polytechnic Institute of Brooklyn on December 27. At a dinner in the Hotel Bossert following the symposium, Colonel Ralph Hufferd, of Edgewood Arsenal, Maryland, will report on "Munitions Developments of the Chemical Warfare Service." Dr. Joseph C. Elgin, chairman of the department of chemical engineering of Princeton University, is chairman of the symposium committee, and Dr. Donald F. Othmer, head of the department of chemical engineering at the Polytechnic Institute, is chairman of the local arrangements committee. Thomas H. Chilton, director of the technical division of the engineering department of the experimental station of the du Pont Company in Wilmington, is chairman of the division.

Two graduate research fellowships have been established at the Philadelphia College of Pharmacy and Science by the Lederle Laboratories. These fellowships extend over a period of two years and afford the recipients the opportunity to do original research and, at the same time, complete the prescribed studies leading to the master's degree. Inclusive of tuition, the value of the awards will amount to over $1,000 per year.

THE U. S. Patent Office offers opportunities to engineering graduates as members of its examining corps for lifetime careers in the service of the Federal Government. The present entrance salary is $2,320 per year for a junior patent examiner, professional and scientific grade 1. After three months of satisfactory service a junior examiner is eligible for promotion to grade P-2, $2,980; after three and a half years in the office to grade P-3, $3,640, and after six years to grade P-4, $4,300. At present, grades P-5, P-6 and P-7, $5,180, $6,230 and $7,175, are the ratings of assistant division chiefs, primary examiners and examiners-in-chief, and the positions are filled by promotion from the examining corps. The Personnel Office of the U. S. Patent Office will be glad to supply any additional information upon request.

THE Wellcome trustees have endowed a chair of tropical medicine, tenable at the London School of Hygiene and Tropical Medicine of the University of London.

ACCORDING to a recent vote of the council, the next meeting of the Society of American Bacteriologists will be held in Detroit, Mich., on May 21–24, 1946. The headquarters will be at the Book-Cadillac Hotel. Plans for the program include reports on recent research from members of the society together with addresses by at least two speakers on topics of general interest. Round-table and symposia sessions on a variety of problems, including war-time research in bacteriology, will be included in the program. There will also be scientific and commercial exhibits. Members of the society should note that March 4, 1946, is the deadline for acceptance of abstracts and requests for exhibits. All abstracts should be submitted to the chairman of the program committee, Dr. L. S. McClung, 420 Kirkwood Hall, Bloomington, Ind. Requests for exhibits should be addressed to Dr. Joseph A. Kasper, Bureau of Health Laboratory, Herman Kiefer Hospital, Detroit 2, Mich.

THE Division of High-Polymer Physics of the American Physical Society will hold its second regular meeting at Columbia University, on January 24, 25 and 26, as one of the features of the general, annual meeting of the society. On the program of the division meeting are approximately twenty-five papers on rubbers, plastics and other high-polymeric materials, covering both the analysis of physical behavior and experimental techniques.

THE Rocky Mountain Biological Laboratory, closed for the duration of the war, will reopen for classes for students next summer, beginning on July 15. The courses scheduled are ecology, field botany and parasitology. The laboratory is situated eight miles from Crested Butte, Colo., in the Gunnison National Forest at an altitude of 9,500 feet; surrounding mountains rise to an altitude exceeding 13,500 feet. Much of the area around the laboratory is almost virgin territory for the research biologist. Independent investigators are welcome to carry on research on alpine biological problems. Communications should be addressed to Dr. John C. Johnson, director of the laboratory, Box 262, Edinboro, Pennsylvania, or to Dr. A. O. Weese, professor of zoology, University of Oklahoma, Norman, president of the board of trustees of the laboratory.

THE correspondent at Delhi, India, of *The Times*, London, announces that the establishment of an Indian National Research Council, authorized to initiate immediately a five-year program of development in the field of scientific and industrial research, is recommended to the Government of India in a report by the Industrial Research Planning Committee. The plan includes the building and equipment of national chemical and physical laboratories and of nine specialized research institutes—for food technology, metallurgy, fuel, glass and silicate, oils and paints, buildings and roads, leather and tanning, industrial fermentation and electro-chemistry; the all-round strengthening of existing research organizations; and the obtaining of seven hundred research workers to man the laboratories by the award of scholarships tenable in India and abroad. All the provinces and larger states are advised to set up laboratories for the investigation of scientific questions of local interest. The committee remarks that current scientific research in India does not represent the bare minimum, whether judged by international standards or by the requirements of India in its present state of industrial development.

SPECIAL ARTICLES

ORAL PENICILLIN—A COMPARISON OF VARIOUS MODES OF ADMINISTRATION[1]

IT has been demonstrated by Free, Leonards, McCullagh and Biro[2] that orally ingested penicillin is absorbed from the gastrointestinal tract in significant amounts. This finding has been confirmed by many laboratories and György, Vandergrift, Elias, Colio, Barry and Pilcher[3] and Free, Huffman, Trattner and Brown[4] have shown that gonorrhea may be successfully treated by orally administered penicillin.

The relative effectiveness of oral and parenteral penicillin in the treatment of disease has not been definitely established, but the general feeling is that perhaps 4 to 5 times as much oral penicillin is required to produce the same therapeutic effect as parenteral penicillin. Most investigators have ascribed this difference to the destruction of penicillin by gastric acid when it is given orally. The present report describes studies of the destruction of penicillin by gastric acidity and the efficacy of different forms of oral penicillin.

The subjects used in the first part of the present study were healthy young adults with both sexes equally represented. The subjects reported at the laboratory after an overnight fast voided and were

[1] From the Departments of Biochemistry and Medicine, School of Medicine, Western Reserve University, the Medical Service of University Hospitals, Cleveland, Ohio, and the Ben Venue Laboratories, Inc., Bedford, Ohio.

[2] A. H. Free, J. R. Leonards, D. R. McCullagh and B. E. Biro, SCIENCE, 100: 431, 1944.

[3] P. György, H. N. Vandergrift, W. Elias, L. G. Colio, F. M. Barry and J. D. Pilcher, *Jour. Am. Med. Asn.*, 127: 639, 1945.

[4] A. H. Free, L. F. Huffman, H. R. Trattner and H. B. Brown, *Jour. Lab. and Clin. Med.*, 30: 738, 1945.

then given the penicillin. Quantitative urine samples were collected at the end of 1 hour, 2 hours, 4 hours and 6 hours. The penicillin content of the urine was determined by the cylinder plate method on specimens suitably diluted with phosphate buffer.

Table 1 shows the urinary excretion of penicillin following the administration of 100,000 units either

TABLE 1

AVERAGE URINARY EXCRETION OF PENICILLIN FOLLOWING ADMINISTRATION OF 100,000 UNITS

Number of subjects	Mode of administration	0–1 hr.	1–2 hr.	2–4 hr.	4–6 hr.	Total
11	Intramuscular injection	38210	16350	5720	700	60980
13	Orally-dissolved in water	4740	5410	2780	720	13650
8	Intraduodenally by tube	10240	7220	4170	1200	22830
7	Orally-dissolved in sodium citrate solution	5820	10210	5630	1400	23060
6	Orally-suspended in oil	4570	5500	2680	1700	14450
5	Orally-dissolved in milk	4100	7100	5460	1280	17940
6	Orally-sealed gelatin capsules	2650	7360	4530	920	15460
6	Orally-enteric coated capsules	1800	7030	4270	1140	14240
4	Orally-mixed with raw egg	4600	6660	3440	1650	16350
3	Orally in solution with bile salts	6220	3730	1830	690	12470

intramuscularly, intraduodenally, orally with water or orally along with various other substances. The amount of penicillin excreted after intramuscular injection was approximately 60 per cent. of the administered dose. These results are in agreement with most of the data in the literature. In the same group of subjects the ingestion of 100,000 units orally dissolved in 250 cc of water resulted in an average excretion of approximately 14,000 units. These results are in agreement with earlier data obtained by the authors[2] but are somewhat greater than some of the values obtained by other laboratories. In 8 of the same subjects a tube was passed into the duodenum and the position of the tube was determined either by fluoroscopic examination or by the character of the aspirated contents, as indicated by an alkaline reaction, the presence of bile and the presence of pancreatic enzymes. In these subjects 100,000 units of penicillin dissolved in 100 cc of water was instilled into the duodenum at a constant rate over a period of 15 minutes. Following this the tube was pulled back into the stomach and the gastric contents aspirated. In no instance did the gastric contents contain any regurgitated penicillin as indicated by either pigment or assay. The excretion of penicillin following intraduodenal administration averaged approximately 23 per cent. of the ingested dose. This is somewhat greater than after oral ingestion but does not approach that observed following intramuscular injection. In 7 of the subjects the oral administration of penicillin in a solution containing 5 gm of sodium citrate resulted in a urinary excretion quite comparable to that following direct instillation of the penicillin into the duodenum. However, the total excretion again does not compare with that following intramuscular administration. These results with sodium citrate confirm the findings of Charney, Alburn and Bernhart.[5]

Other modes of administration of penicillin included solution in milk, mixed raw egg or bile salts solution, suspension in sesame or corn oil, and in sealed gelatin capsules and enteric coated capsules. The advantages of any of these modes of administration over simple aqueous solution is in no instance

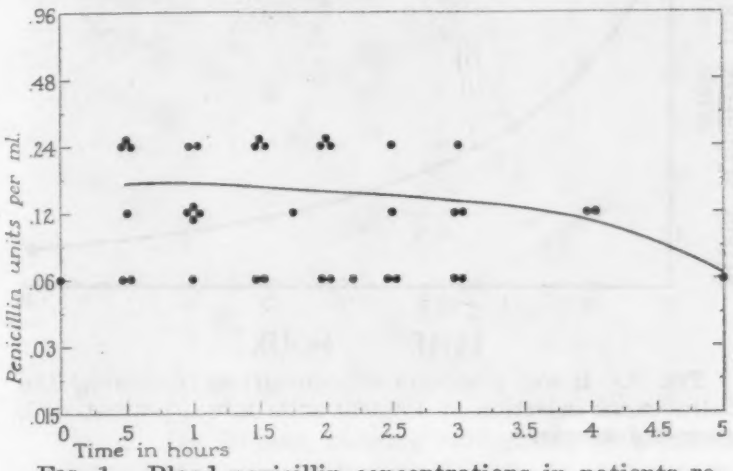

FIG. 1. Blood penicillin concentrations in patients receiving 100,000 units of penicillin orally.

marked although from the point of view of taste the gelatin or enteric capsules were quite advantageous.

In the second part of the study, penicillin was administered orally to patients on the wards of Lakeside

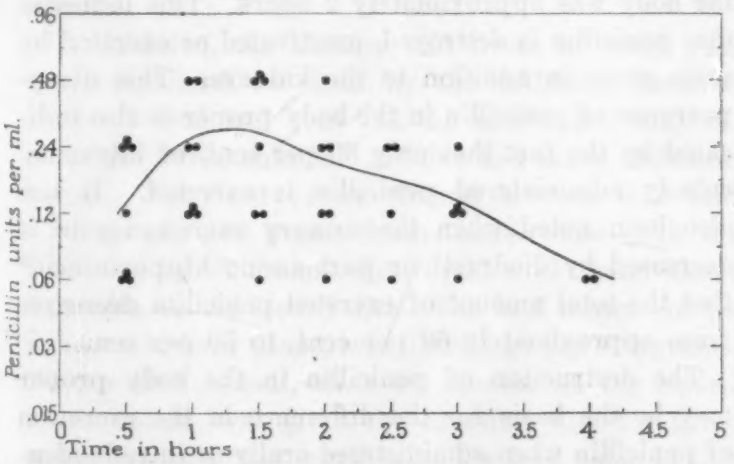

FIG. 2. Blood penicillin concentrations in patients receiving 100,000 units of penicillin orally along with potassium citrate.

Hospital. It was put up in gelatin capsules and was routinely given in 5 doses a day at 2 and 7 P.M., midnight, and 5 and 10 A.M. with 100,000 units as the standard dose. Blood was taken at intervals after

[5] J. Charney, H. E. Alburn and F. W. Bernhart, SCIENCE, 101: 251, 1945.

at least one of the doses for assay. The results are given in Figs. 1 and 2. It will be seen that 100,000 units of penicillin given alone produces a satisfactory blood concentration for several hours. With the addition of potassium citrate the peak concentration is raised, but there is little difference in the duration of an appreciable blood concentration. The results of administration of penicillin simultaneously with aluminum hydroxide gave essentially similar results.

Fig. 3 indicates the blood level of penicillin of a patient who received 100,000 units intravenously.[6]

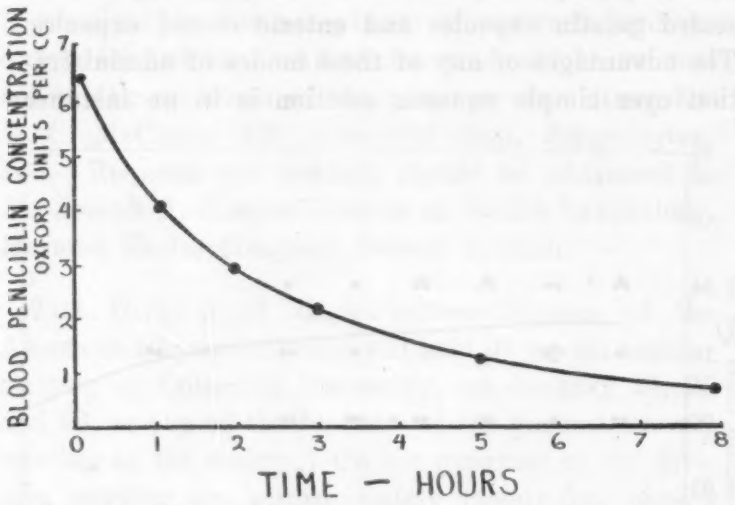

FIG. 3. Blood penicillin concentrations following the intravenous injection of 100,000 units into a patient with complete anuria.

This white female, 46 years of age, had 3 days previously taken a lethal dose of mercury bichloride. At the time the penicillin was injected a complete anuria existed so that no urinary excretion was possible. The blood concentration, however, decreased at a rate which suggested that the half life of penicillin in the body was approximately 2 hours. This indicates that penicillin is destroyed, inactivated or excreted by some route in addition to the kidneys. This disappearance of penicillin in the body proper is also indicated by the fact that only 60 per cent. of intramuscularly administered penicillin is excreted. It has also been noted when the urinary excretion rate is decreased by diodrast[7] or para-amino hippuric acid[8] that the total amount of excreted penicillin decreases from approximately 60 per cent. to 30 per cent.

The destruction of penicillin in the body proper may be the basis for the difference in the excretion of penicillin when administered orally or intraduodenally as compared with the excretion of parenterally administered penicillin. In the one instance the excretion is exceedingly rapid during the first few minutes after injection so that the exposure time to "destructive" influences is quite short. On the other hand, penicillin absorption from the gastrointestinal tract results in a more uniform rate of entry of penicillin into the circulation and in general the rate of excretion is fairly uniform during the first 2 hours after ingestion. This results in a longer exposure of penicillin to possible destructive influences. It may be significant that orally or duodenally administered penicillin enters the portal circulation and is exposed to the metabolic activities of the liver, whereas parenterally administered penicillin is not nearly so completely exposed to this influence. It is also known that certain of the bacteria of the intestinal flora elaborate penicillinases which rapidly inactivate penicillin. However, the site of absorption of penicillin and the location of significant amounts of the enzyme in the intestine are not sufficiently defined to indicate whether or not such destruction may be of significance.

SUMMARY

A comparison of penicillin excretion when equivalent quantities of the drug are given orally or parenterally indicates that approximately 60 per cent. urinary excretion occurs after parenteral administration, whereas 14 per cent. urinary excretion occurs following oral ingestion. That destruction by gastric acidity is not primarily responsible for this difference is indicated by the fact that administration of penicillin directly into the duodenum does not greatly alter the amount of penicillin excretion. Evidence indicating that the majority of orally administered penicillin is destroyed by the body proper is discussed.

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IMPAIRMENT OF REPRODUCTION IN RATS BY INGESTION OF LEAD

ACCIDENTAL contamination with lead of an experimental diet for rats led to results which appear confirmatory of the thesis that sterility, high incidence of abortion and excessive infant mortality in human populations may be caused by chronic lead poisoning.[1] Report of our results is of interest because Calvery and associates in an extended series of papers[2] were unable to reproduce such effects of lead poisoning either in rats or dogs by feeding lead acetate or lead arsenate. It may be significant that our animals ingested lead largely in metal form.

[6] The studies on this patient were done in collaboration with Dr. Max. Miller, of the Department of Medicine, School of Medicine, Western Reserve University, and the Medical Service of University Hospitals, Cleveland, Ohio.

[7] C. H. Rammelkamp and S. E. Bradley, *Proc. Soc. Exp. Biol. and Med.*, 53: 30, 1943.

[8] K. H. Beyer, L. Peters, R. Woodward and W. F. Verwey, *Jour. Pharm. and Exp. Therap.*, 82: 310, 1944.

[1] R. M. Hutton, "Lead Poisoning; a compilation of present knowledge." Provincial Board of Health of Ontario, Toronto. 1923.

[2] *Jour. Pharmacol.*, 64: 364–464, 1938.

A total of 78 pairs of rats and their progeny were involved in our study. The experimental diet consisted of an intimate mixture of about 65 articles of food which are most prominent in the American diet, in the approximate proportions in which they are consumed. This diet was inaugurated in late January, 1941, during the late stages of the pregnancies which gave rise to the litters from which these 78 pairs were selected and was continued through a period of about nine months. Growth of the original young was normal and no suspicions arose until the progeny of these young began to appear. The mortality among the young of the second generation was very high, ranging from 20 to 80 per cent. and averaging about 50 per cent. for the entire period. Most of the deaths occurred at birth or within a day or two thereafter. Many young were destroyed by the mothers as they approached weaning age. The young which survived were without exception stunted in growth, attaining weights of from 30 to 45 grams at 28 days of age. They appeared anemic and their fur was stained brown, and was greasy and matted.

A number of maternal deaths occurred near the end of term. In addition, some five males and seven females became quite sterile. Two of these females recovered fertility after transfer to the Sherman diet (one-third whole milk, two-thirds whole wheat) for ten to twelve weeks. Several other mothers also later reared normal young after transfer to this diet.

From time to time throughout their adult lives, individuals of the original 78 pairs contracted what appeared to be pulmonary disease. A total of thirteen rats died from this cause. Of these, seven were thoroughly examined post mortem and all found to have died of pneumonia which in several cases was lobar in distribution and croupous in character. A type XIX pneumococcus was recovered from three of the seven. Since many were examined long after death, the actual incidence may have been higher. It was further noted that the kidneys were of a dark red color and apparently somewhat enlarged. In the histologic preparations large, acidophilic inclusion bodies were found to be numerous in the epithelium of the convoluted tubules of every animal (Fig. 1). Casts and thickened blood vessels were seen in some cases as well. Seven other rats were therefore sacrificed. None of these had pneumonia, but inclusion bodies were again present in every animal. It was evident that, while the deaths were due to pneumonia, all the animals suffered from another, unrelated disease.

Identical inclusion bodies have been described by Blackman[3] in the kidneys of infants poisoned by lead and in rats fed lead acetate. Accordingly, seven lots of the ration were assayed for lead. The lead content varied from 0.5 to 12 mgs per 100 grams, the average value being 3.5 mgs. The source of the lead was found to be certain concealed babbitted bearings of the masticator used in mixing the ration. The

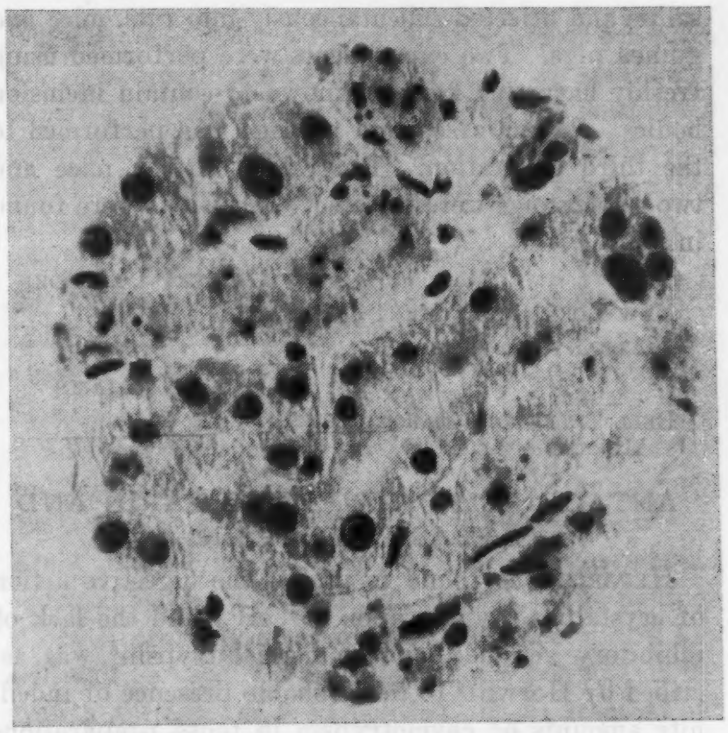

FIG. 1. Rat kidney, showing acidophilic, intranuclear inclusion bodies, abnormally large nuclei and black, granular deposits.

food did not come in direct contact with these bearings, but small variable amounts of lubricating grease, heavily charged with lead, exuded occasionally through crevices at the ends of the blades into the mixing chamber.

In addition, the kidneys and livers of seven rats were examined for lead by the dithizone method. Five of these had been fed the mixed diet continuously for seven months. All five had many inclusion bodies. The lead values ranged between 0.25 and 0.7 mgs per 100 grams fresh tissue. The sixth rat had been fed Sherman's diet for 11 weeks after about 6 months on the leaded diet. The lead content of its kidney and liver tissues was 0.024 mgs per 100 grams. The seventh animal, after six months on the leaded mixed ration, was given the Sherman diet for three weeks before it was sacrificed. The lead value in this case was 0.18 mgs. In neither of the latter two animals were inclusions found.

Eighteen rats less than three weeks old were also examined. These varied from newborn to animals about to be weaned. In none were inclusion bodies found. Three litters were examined for lead, using pooled kidneys and livers. In every case the amount of lead present was less than in the mother. In two

[3] S. S. Blackman, Jr., *Bull. Johns Hopkins Hospital*, 58: 384, 1936.

cases, the values were approximately a third less and in one case less than a half.

The relationship, if any, of the incidence of pneumonia in the adults to lead poisoning is unknown.

In view of Hindle's[4] report, an attempt was made to transmit the inclusions to animals fed standard diets. Kidney suspensions were prepared in broth-saline and injected subcutaneously into rats, mice and guinea pigs. Two experiments were performed using freshly harvested kidneys known to contain inclusion bodies. In one case blind passage was performed to the third generation. Ten rats, fourteen mice and two guinea pigs were injected. Inclusions were found in none.

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ANTAGONISM BETWEEN HEPARIN AND PLASMA TRYPSIN

HEPARIN was found to inhibit the digestive action of crystalline trypsin upon casein[1, 2] and the lack of inhibitory action upon commercial trypsin[3] was ascribed by Horwitt[4] to the probable presence of indefinite amounts of chymotrypsin in those preparations to be found in the market, since chymotrypsin is not inhibited by heparin. On the other hand, heparin is being largely used as therapeutic agent in thrombosis and recently[5] it was reported the protective action of heparin against necrosis produced by extreme local cold (frost bite). Since activation of plasma trypsin might constitute a common mediator in many manifestations following thrombosis and platelet disintegration, we have found it advisable to study the effect of heparin upon the proteolytic enzyme found in normal plasma. Trypsin is present in plasma in a free (I) and a bound (II) condition[6,7] and can be estimated following precipitation either with acetone (I) or with a 2.5 per cent. solution of trichloracetic acid (II), incubation of the whole precipitate (resuspended in buffer pH 8.4) for 48 hours and final estimation of the N P N. Heparin added either before precipitation or after the preparation was set up for incubation, had a strong inhibitory effect as shown in Table 1.

TABLE 1

Exp. No.	Material used	Amount of heparin* added	Trypsin (mgm NPN/100 ml plasma) Total	Free
I	(a) dogs plasma	0	91.4	31.9
	(b) same + heparin	2 mgs	85.6	3.5
	(c) same + heparin	5 mgs	34.8	−1.9
II	(a) dogs plasma	0	114.0	19.4
	(b) same + heparin	10 mgs	12.6	4.8
	(c) same + heparin	10 mgs	49.1	...

* The heparin used in those experiments was a crystalline sodium salt of beef heparin (11 units per mgm) kindly supplied by Dr. L. B. Jaques of Toronto, Canada.
Note: In experiment II c, heparin was added after precipitation by trichloracetic acid and immediately before incubation.

The fact that heparin displays a definite inhibitory effect upon plasma trypsin when added before activation of the enzyme by addition of trichloracetic acid might be explained by assuming that it strengthens the effect of the natural inhibitor present in plasma. This agrees with Ferguson's view[7] that the polypeptide-like inhibitor of trypsin present in plasma might have acidic groups analogous to those of heparin or that heparin might constitute a prosthetic group for this inhibitor. A more extensive report will follow this note.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE USE OF A PLANIMETER IN VOLUME STUDIES OF EARLY EMBRYOS

THE shape of developing ova after the first cleavage division does not allow accurate volume calculation on the basis of diameter or radius, a fact which must at least partly explain the absence of data pertaining to this problem.

The volumes of more than eighty ova and blastocysts have been successfully ascertained by the planimetry of serial sections of known thickness.

Serial ten micron sections of the specimens were projected at two hundred diameters of magnification and the outline of each section was accurately traced on suitable paper. The average of ten planimeter readings was taken for each section and the values

[4] E. Hindle, *Nature*, 129: 796, 1932. E. Hindle and F. Coutelen, *Compt. Rend. Soc. Biol.* 111: 870, 1932.
[1] M. K. Horwitt, SCIENCE, 92: 89, 1940.
[2] A. J. Glazco and J. H. Ferguson, *Proc. Soc. Exp. Biol. and Med.*, 45: 43, 1940.
[3] J. A. Wells, C. A. Dragstedt, J. A. Cooper and H. C. Morris, *Proc. Soc. Exp. Biol. and Med.*, 58: 57, 1945.
[4] K. Lange, L. J. Boyd and L. Loewe, SCIENCE, 102: 151, 1945.
[5] A. Schmitz, *Z. physiol. Chem.*, 250: 37, 1937.
[6] N. K. Iyengar, K. B. Sehra and B. Mukerji, *Ind. med. Gaz.*, 57: 348, 1942.
[7] J. H. Ferguson, SCIENCE, 97: 319, 1943.

for each section of a specimen added together. The planimeter was adjusted to read in cm². Volume of the specimen was then calculated in the following manner:

$$\text{Volume} = \text{total area (in cm}^2) \times \frac{\text{thickness of section} \times \text{microns}^2 \text{ per cm}^2}{\text{diameters of magnification}^2}$$

$$\text{Volume} = \text{total area (in cm}^2) \times \frac{10 \text{ microns} \times 100{,}000{,}000 \text{ microns}^2}{200 \times 200}$$

$$\text{Volume} = \text{total area (in cm}^2) \times \frac{1{,}000{,}000{,}000 \text{ microns}^3}{40{,}000}$$

$$\text{Volume} = \text{total area (in cm}^2) \times 25{,}000 \text{ microns}^3$$

It has been found that figures for the volume of a specimen can be closely checked by repetition of the whole process including the tracing and planimetry.

It must be remembered that the two surfaces of a section of a spherical structure will have different areas unless the section is equatorial, but that in planimetry the section must be considered one of a cylinder. It may be possible to decrease such error by averaging the area of the two surfaces in order to approach the area of the mid-plane of the section. Whether such a technique would give more accurate absolute volume can not be stated, but it does not appear that it would offer advantages in determining relative volumes of different specimens. The same problem arises in connection with wax plate reconstruction where the wax plates must be cut perpendicular to the surface, thereby leaving edges which must be rounded off to produce a smooth contour.

The technique of planimetry is well known to the engineers but, so far as can be determined, this is its first direct application to volume studies of early embryos where it offers an easy and convenient method of determining the volume of irregular objects. Data resulting from this study will be presented in detail elsewhere.

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THE USE OF CHARCOAL TREATED PEPTONE IN MICROBIOLOGICAL ASSAYS

MICROBIOLOGICAL assays using the *Lactobacillus arabinosus* for the determination of nicotinic acid, biotin and pantothenic acid are widely employed.[1, 2, 3] Charcoal-treated casein hydrolysate forms the chief source of nitrogen in the medium used for these determinations. The preparation of the hydrolysate is laborious. If purchased commercially, it is expensive. It has been found possible to replace the hydrolysate satisfactorily in media used for assay of biotin, niacin or pantothenate with charcoal-treated peptone. Blanks and maximal acid production obtained with the peptone are satisfactory and the preparation of the peptone is simple.

METHOD

100 grams of Bacto-Difco peptone are dissolved in 800 cc of distilled water. The pH of the solution is adjusted to 3.0 with concentrated HCl. A faint cloud forms at this point. Twenty grams of the activated charcoal, Darco G60, are added and the mixture stirred mechanically for an hour. The solution is then filtered by suction. The pH is readjusted to 3.0 with concentrated HCl, 10 grams of Darco G60 added, and the mixture stirred for an hour, after which it is filtered by suction. The filtrate should have no more than a faint tinge of color. The volume is adjusted to one liter and the solution preserved under toluene. Ten cc of this solution are substituted for each 5 cc of casein hydrolysate in the medium of Krehl, Strong and Elvehjem.[2] The peptone should be tested before being used for assays. If the peptone has been properly prepared, less than 2.0 ml of 0.1 N acid will be produced in tubes from which one of the growth factors has been omitted and at least 17 ml of 0.1 N acid will be produced after 66 hours' incubation at 37° C. in the presence of 2.0 micrograms of calcium pantothenate, 2.0 micrograms of nicotinic acid and 0.01 micrograms of biotin.

The blanks and maximal acid production obtained with a typical lot of peptone when substituted for casein are compared with the blanks and maximal acid production obtained with casein hydrolysate in Table 1.

TABLE 1

BLANKS AND MAXIMAL ACID PRODUCTION OBTAINED WITH CHARCOAL TREATED PEPTONE AND CASEIN HYDROLYSATE

Vitamin	Peptone		Casein	
	Blank	Maximum	Blank	Maximum
Biotin	1.5	18.1	1.74	17.55
Pantothenic acid	1.9	18.6	1.2	18.7
Nicotinic acid	0.84	19.0	0.6	18.3

All results are expressed as cc of 0.1 N acid produced after 66 hours' incubation, and are the averages of duplicate determinations.

TABLE 2

COMPARATIVE ASSAY VALUES FOR RAT URINE FOUND IN PARALLEL RUNS USING PEPTONE MEDIA AND CASEIN HYDROLYSATE MEDIA

Test	Value with peptone medium*	Value with casein medium*
Nicotinic acid	1.6	1.65
Calcium pantothenate	6.2	6.3
Biotin	0.02	0.02

* Expressed in micrograms per ml.

[1] E. E. Snell and L. D. Wright, *Jour. Biol. Chem.*, 139: 675, 1941.

[2] W. A. Krehl, F. M. Strong and C. A. Elvehjem, *Ind. Eng. Chem., Analyt. Ed.*, 15: 471, 1943.

[3] H. R. Skeggs and L. D. Wright, *Jour. Biol. Chem.*, 156: 21, 1944.

Comparative assays for nicotinic acid, biotin and pantothenate using peptone and casein hydrolysate have yielded identical figures on a variety of materials.

A simple method is described for the preparation of charcoal treated peptone solution which may be substituted for casein hydrolysate in microbiological assays with *Lactobacillus arabinosus*.

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DISCUSSION

A PROPOSAL FOR THE FORMATION OF A WORLD ASSOCIATION OF PHYSICISTS OR NUCLEAR SCIENTISTS

THE construction of the atomic bomb was brought about chiefly by physicists. Two German chemical-physicists, Hahn and Strassmann, unmindful of the threat of impending war, gave to the world the key for unlocking the storehouse of one form of atomic energy. Physicists of the British Commonwealth and America, including recent refugee physicists from Continental Europe, under compulsion of self-defense in a war thrust upon us, have discovered new essential chemical elements and have carried through to a successful conclusion the vast enterprise of manufacturing atomic bombs of colossal destructive power. The war is over. Let us now organize a World Association of Physicists. Members in this association would subscribe to certain principles: (1) respect for and confidence in the labors of all its members irrespective of nationality; (2) a pledge not to give advice concerning, or assist in making, atomic bombs; (3) a pledge to continue research in fundamental physics, including the physics of the nucleus of atoms, all atoms; (4) to publish the results of such research; (5) to assist in experiments leading to the beneficial application of atomic energy to human problems, and (6) to welcome the physicists of other nations to our laboratories.

This association would be not only international, it would be supernational. At least its members would not take orders from any government to assist in making atomic bombs. And since its membership would probably include 99 per cent. of the physicists of the world, atomic bombs would not be made. For the making of such a bomb requires the ultimate in knowledge concerning radioactive and nuclear physics. No novice would dare handle the components of a bomb. To attempt to do so would probably lead to his own extermination and the extermination of everything and everybody in his vicinity. Workmen could not be hired to work in a plant in which the ingredients of a bomb were being assembled, unless they had vast confidence in the knowledge and skill of those in charge. All that would be necessary to bring about a complete exodus of workers from a plant would be for the leading physicists of the country to set forth their belief that the chief personnel of the plant were lacking in scientific knowledge and skill. The ingredients of atomic bombs would not be made in that plant.

The association would not be regarded as formed until 90 per cent. of the physicists of every major nation, as determined by the principal physics society of that nation, had subscribed to the principles and accepted membership. The holding back by the physicists of any major nation would release all tentative members of their pledges.

The details regarding officers would be worked out by representatives from the chief physics societies of the various major nations. This proposal, perhaps with variations, will be submitted to the members of the American Physical Society and affiliated societies at their forthcoming meeting in New York.

It is believed that the formation of an association of scientists as above outlined would do away with warfare by atomic bombs. There would remain the gentle kind of warfare that was in vogue up to August 5, 1945. Perhaps associations of scientists could outlaw also that kind of war.

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REVERSAL IN THE WINTER FLOUNDER, PSEUDO-PLEURONECTES AMERICANUS: THE THREE KNOWN CASES

IN 1935, in a paper on "Reversal of Sides in Flatfishes,"[1] I brought together all the accounts that I could find of reversal in flatfishes, and tabulated the specific data (dates, sizes, figures, etc.). After a careful search I found a solitary record of a reversed *Pseudopleuronectes americanus*.

No. I. In "Biological Notes" from Woods Hole, Mass.,[2] is this record from Vinal N. Edwards. *"Pseudopleuronectes americanus:* A male in spawning condition, 14 inches long, taken in a fyke net in Waquoit Bay, February 23, 1900, has eyes on the left side—the first of the kind I have taken." To those who know the meticulous care with which for over 30 years Vinal Edwards made his records, nothing more need be said. What became of this first recorded reversed winter flounder is not known, but it remained a unique record for over forty years.

[1] E. W. Gudger, *Jour. Morphol.*, 38: 1–39, 5 figs.

[2] V. N. Edwards, *Bull. U. S. Bureau of Fisheries*, for 1899, 1901, vol. 19, p. 305.

No. II. The history of the second known reversed winter flounder is as follows: Late in October, 1943, Charles Sciarini, of the Borough of Queens, New York City, hooked this fish in Shinnecock Bay on the ocean side of Long Island. He recognized it as an "oddity," took it home and with good judgment put it in the refrigerator. In December, his father, Louis D. Sciarini, in some way, learned that I was interested in abnormal fishes, and called me on the telephone to say that he had a "left-handed" flounder that ought to be right-handed, and that he wanted to know about it. I explained and said that I wanted this fish badly. He then said that he would keep it frozen until he could send it in to me.

Some time in January, 1944, Charles Sciarini brought to me this fish, at that time the only extant specimen of a reversed *Pseudopleuronectes americanus* in any collection. And with it, for comparison, he brought a small normal specimen. But for the good judgment of father and son in keeping this fish frozen, this precious specimen would have been lost to science. After being in alcohol for about 21 months, it measures 6.4 inches in standard and 9 inches in total length, and 3.3 inches in depth (body only). Its weight is 4 ounces.

Specimen No. III. Our second fish was caught on June 10, 1945, by Fred Sterzenback, of Ridgewood, Brooklyn, N. Y., out of Freeport on the ocean side of Long Island. The fish was taken on a hook baited with a clam, and behaved like the other and normal flounders. After nearly 5 months in alcohol, it measures 9.4 inches in standard length and 11.4 over all, and is 4.5 inches deep (body only). Its weight is 9.5 ounces. Except for being reversed it, like the other reversed fish, is entirely normal in all other respects.

Our specimens are young fish. In waters contiguous to New York, the winter flounder is known to reach a length of 20 inches and a weight of 5 pounds, but the average is about 15 inches and 1.5 pounds for a good-sized fish.

In a postscript to my article, "Reversal in Flatfishes" (1935), I noted that, while that article was in press, two reversed ambicolorate halibuts, and two reversed flounders (summer and winter) had been received at the Museum, and that all these would presently be described. This was done for the two halibuts and for the summer flounder, but not for the winter flounder.

It being at that time the second known reversed fish of its species, and the easiest to describe, naturally should have been the first worked up. However, this was not done. And now this fish can not be found in the tank in which all abnormal fishes are kept, nor are any notes available.

How rare reversed specimens of *Pseudopleuronectes americanus* are may be gathered from the following statement from Dr. Daniel Merriman, Director, The Bingham Oceanographic Laboratory, New Haven, Conn.:

> During the detailed analyses of the Connecticut trawl fishery carried out by the staff of the Bingham Oceanographic Laboratory at Yale, in the last two years over 11,000 winter flounders have been examined for at least weight, length and sex, and frequently scales and otoliths have also been taken on these specimens. Approximately 3,000 more have had lengths and weights taken on them, and approximately 3,200 more have been tagged and measured. So far as we are aware, none of those fish have been reversed, and I think that it can be stated with reasonable assurance that had any of them been reversed we could hardly have failed to notice it. With the exception of the tagged individuals these fish were all examined in the laboratory where they came under the scrutiny of at least several members of the staff. Apart from all the above mentioned fish, we have handled countless thousands aboard the commercial fishing vessels, and have not noticed any reversed individuals. Of course the handling of fish in the field means that they were not subject to such close scrutiny as those that passed through our hands in the laboratory, but it seems to me that the conclusion that the incidence of reversed winter flounders is *extremely low* is inescapable.

With reference to the areas from which these winter flounders came, Dr. Merriman writes that:

> The vast majority of our catches came from the Block Island Sound area, a relatively small percentage came from Long Island Sound proper, and a still smaller lot from more distant localities such as the south side of Long Island and the Southern Rhode Island and Massachusetts coast.

The winter flounder is one of the flatfishes with the fewest known cases of reversal. On the other hand, the starry flounder, *Platichtys stellatus,* a right-sided cold-water species, of the north Pacific, has the greatest number of reversed individuals for any member of the order Heterosomata. Hubbs found the percentage of rights and lefts of this fish in California waters to be 50–50. In Alaskan waters 75 per cent. were lefts, while in Japan the fish was 100 per cent. left-handed. Why some flounders are reversed, and why there should be this great diversity of reversal in the starry flounder has not been explained so far as I know.

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AID FOR WAR-DAMAGED SCIENTIFIC LIBRARIES

THE appeal of O. W. C. Herre in the issue of SCIENCE for December 7 for aid in rebuilding the scien-

tific library of the Bureau of Science in the Philippines, which "the Japanese wantonly destroyed," suggests that there is an additional way in which libraries damaged by the aggressor nations could and should be repaired. Germany and Japan, to be sure, can not make adequate financial reparation, but their surviving scientific books and journals can replace at least some of those that they have destroyed in allied and "neutral" countries. The control that we now possess over the resources of these two countries should make it feasible to bring about this adjustment. Possibly this reparation in kind is already being arranged—if so, so much the better. If not, let us hope that it will be urged upon the allied governments by appropriate scientific organizations.

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OSTEOPATHY AND UNIVERSITY PRESIDENTS

To the Signatories to the Petition to President Truman for the Deferment of College Science Students

DEAR SIRS:

IN the November 16th issue of SCIENCE appears a letter signed by you and seven other educators appealing to President Truman to alter certain current Selective Service practices. Although I am in hearty sympathy with the motives which undoubtedly prompted your action, I am, nevertheless, impelled to protest vigorously about one element in your statement which casts a serious shadow over the entire document.

In the second paragraph you mention, as deserving deferment, students of "osteopathy" in the same general category with students in such recognized disciplines as medicine, dentistry, pharmacy and engineering. To do so stultifies the entire argument because no American university recognizes osteopathy as a scientifically based healing art, and there is no reason to believe that the biological science faculties of the institutions you represent consider the system of osteopathy to be other than a fraud upon a gullible public. The stupidity or cupidity of some Selective Service official in originally classing students of osteopathy with the others you have listed in granting deferment several years ago is not an adequate excuse for responsible officials of respectable institutions of learning to compound the error now. When university and college heads plead for special consideration for students in the various cults of this type our academic standards and ethics have fallen to a new low. Since when has expediency superseded principle in academic practice? And since when have the institutions you represent and administer given their academic blessing to medical cultism? If those universities, including California, Cincinnati, Cornell, New York University, Vanderbilt and Yale, among others, intend to promote osteopathy it is certainly time for American medical and other biological scientists to take stock of their position.

Actually I am confident that the unfortunate implications of the naming of osteopathic students in this way were not apparent to most of you. Nevertheless, the seriousness of its occurrence, even by inadvertence if such it was, can not be over-emphasized in a world in which the layman looks to science for miracles and can not distinguish between scientific fancy and fact because of an inadequacy of background information which, right or wrong, he looks to persons like yourselves to possess and use.

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SCIENTIFIC BOOKS

THE NATURE OF SPECIES

Experimental Studies on the Nature of Species. II. Plant Evolution through Amphiploidy and Autoploidy with Examples from the Madiinae. By JENS CLAUSEN, DAVID D. KECK and WILLIAM M. HIESEY. Carnegie Institution of Washington Publ. 564. vii + 174 pp. 86 figs. 1945. Paper, $1.25, cloth, $2.00.

THE purpose of this valuable and stimulating contribution is the classification of polyploids in terms of the "biosystematic" categories already made familiar by the same authors: the ecotype, the ecospecies and the cenospecies. The origin and characteristics of three synthesized amphiploids are first described, one of which is found in nature. Then follows an examination of other polyploids and the classification proposed. This in turn is followed by discussions of the ecological characteristics of both autoploids and amphiploids and the course of evolution when polyploidy is involved.

The authors "propose to limit autoploidy to the multiplication of genomes within the limits of one ecospecies. By this definition, *autoploidy* applies to cases ranging from the homozygous individual with multiplied chromosome number, at one extreme, to the polyploid derivatives of a hybrid between subspecies or ecotypes of a species of the other. *Amphiploidy*, in contrast with autoploidy, is the addition of all the

chromosomes of distinct species. In the strictest sense of the term amphiploidy, these species belong to distinct cenospecies. In the widest sense, amphiploidy would also include the addition of the chromosomes of ecospecies of one cenospecies, but these cases are transitional in character and generally less stable."

Ecospecies are defined as "species capable of a limited interchange of genes with one another," cenospecies as "species entirely unable to exchange genes with one another." This ability of species to exchange genes is considered by the authors to rest upon "constitutional barriers" which are "based in the genic structure." Hence the proposed classification rests primarily upon the degree of interfertility of the parents. The result is a bimodal segregation of the known examples, each mode being characterized by differences in cytological behavior, fertility and morphology and, in nature, by different spatial and ecological relationships to the parents.

The weakness of the proposed classification lies in the fact that ecospecies and cenospecies are defined by sterility barriers without reference to other isolating mechanisms. But the existence in nature of such mechanisms may prevent gene interchange despite a relatively high degree of interfertility. Hence it is legitimate to inquire to what extent ecospecies and cenospecies, defined thus, correspond to the realities of nature.

A case in point is furnished by two well-defined diploid species of *Delphinium* (Lewis and Epling, unpubl.) which produce fertile hybrids when crossed in the garden, and backcross readily to both parents. Their interfertility is of the order which would lead to their classification as ecospecies. Here would appear to be a channel sufficient to permit an appreciable exchange of genes between these species. They are sympatric over a large area and in places actually grow together. Their flowering periods overlap. Yet, there is no evidence that even F_1 plants occur in the mixed colonies. These species are seemingly able to exchange genes, but, so far as has been determined, they do not. Hence, the conclusion is difficult to avoid that barriers other than fertility are at play in nature and that rather than being "ecospecies," capable of a limited exchange of genes, as might be indicated by the breeding experiments, they are in fact, "cenospecies," as suggested by the facts of distribution.

Perhaps the question devolves in part upon the term "gene interchange." When fertile hybrids and their recombination products are formed in nature, genes are exchanged (or recombined) in a limited sense. But to become of consequence in speciation such hybrid products would either need to spread and establish themselves, or else they would need to become an actual channel for a flow of genes from one population to the other. Although fertile hybrids may provide such a channel, isolating factors may intervene and prevent a gene flow sufficient to modify either of the parent populations. *Salvia apiana,* for example, is known to hybridize locally with *S. mellifera,* forming local intermediate populations. Yet there is no certain evidence, as yet, that either species has been modified thereby.

Hence, the assumption made that, because fertile recombination products are formed in the frequently observed crosses of *Aquilegia formosa* and *pubescens,* these species are therefore "exchanging" genes and are no more than subspecies, and that the whole genus is a cenospecies, is open to debate. To establish this assumption it would seem necessary to demonstrate an actual absorption of genes from one to another. *A. pubescens,* a member of a section otherwise represented in the Rocky Mountains, is widely separated from its congeners. Its range in the Sierra Nevada is entirely encompassed by that of *A. formosa.* These facts suggest that the species have been in contact for a considerable period. If it can be shown that any appreciable part of *A. pubescens* is more like *A. formosa* than its Rocky Mountain allies, then, it would seem, a basis might exist for demonstrating an actual interchange of genes. So far as known, it maintains its identity. Again, it would appear that although these species are apparently able to exchange genes, they seemingly do not except in the sense of local recombinations.

It may be that, in the final analysis, the barriers are ecological and that these supposed species are in reality only "ecotypes." Nevertheless, before their actual status can be settled, the presence of other than sterility barriers must be reckoned with and the means by which they operate must be ascertained. Hence, the usefulness of the concepts ecotype, ecospecies and cenospecies would seem to be impaired so long as they are defined in terms which are potential, rather than those that are realized in nature. Defined in the latter terms, used for them as alternatives to the concepts subspecies and species might disappear, save in Turesson's original connotation.

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BEETLES IN STORED PRODUCTS

A Monograph of the Beetles Associated with Stored Products. By H. E. HINTON, I. viii + 443 pp. 505 figs. 20 pp. refs. British Museum (Natural History). London. £1-10s.

A WORK representing a series of very important investigations recommended by Professor J. W. Munro

and the Department of Scientific and Industrial Research which was undertaken by the Ministry of Food and printed by the order of the Trustees of the British Museum. It includes scientific studies of the identity, life histories and control of the numerous insects infesting and destroying stored food products which were so essential to the preservation of the British people and for the winning of the war.

This monograph is the most comprehensive of the very many works dealing with these insects. It is thoroughly scientific in its approach and follows along strictly systematic lines complete with keys to adults of the coleopterous families: Carabidae, Staphylinidae, Nitidulidae, Lathridiidae, Mycetophagidae, Colydiidae, Murmidiidae, Endomychidae, Erotylidae, Anthicidae, Cryptophagidae and Dermestidae.

The author has succeeded in producing a splendid scientific monograph, the material of which is so clearly presented as to make it readily understandable to all classes of readers. Great numbers of excellent illustrations have been prepared to elucidate the keys and to aid in readily distinguishing all the various stages of the complicated life histories of these destructive beetles. The drawings of the adults are specially well executed, and some of them are among the finest to be found in modern entomological literature.

In connection with the descriptions of the various stages of each species is included the synonymy of scientific names and references to original sources, the common names, the genotype and comparative notes.

Historical data, world distribution and the hosts are also given for each species. Methods for rearing the beetles and their habits, parasites and predators are likewise fully treated.

A great deal of confusion has been cleared up especially with regard to the identity and synonymy of the beetles belonging to the family Dermestidae. The author's treatment of these important household pests is noteworthy and extremely valuable.

The very complete list of references and an index to orders, families, genera and species enhances its value.

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CHEMISTRY OF ACETYLENE

The Chemistry of Acetylene. By JULIUS A. NIEUWLAND and RICHARD R. VOGT. xi + 219 pp. Reinhold Publishing Corporation. 1945. $4.00.

As stated in the introduction, this volume presents "a brief but fairly complete account of the preparation, properties, and reactions of acetylene" as disclosed in the literature through 1938, this being the last year of free flow of scientific publications. It proceeds from the preparation and properties of acetylene, through metallo derivatives, non-metallic derivatives and, finally, to the polymerization of acetylene.

The coverage of the literature for this period is very thorough, and the bibliography is extensive, well classified and well indexed. The arrangement of the subject-matter is orderly and logical, and the manner of presentation of the data is clear.

The book is very free of typographical errors. One, however, might be noted. In Table I, page 31, the ratio of gas to liquid concentration should have been reversed, as the figures are actually the ratios of concentration in the liquid to concentration in the gas phase.

The patents relating to acetylene and acetylene derivatives have been extensively consulted and discussed. Due, probably, to the difficulty of interpreting these with accuracy, and the further difficulty of determining which of them are actually in use, this part of the discussion is non-critical in tone, no attempt being made, for the most part, to do more than to record the statements made by the patentees. The more purely scientific part of the literature, however, is treated much more thoroughly and authoritatively, particularly those subjects which lie within the rather broad field of acetylene chemistry worked in by the authors. Since both sources of information are frequently used in connection with the ame subject, the treatment appears, superficially, to be much less critical than is actually the case. As a supplement, the syntheses of monovinylacetylene and its most important derivative, neoprene, are discussed at some length.

In spite of the fact that the literature could be covered only up to 1938, this book is a very welcome and valuable addition to the A.C.S. Monograph series, and should be in the library of any one interested in the field of acetylene and its reactions. It is to be hoped that when the necessary information becomes available, it will be brought up to date so as to include the developments of the war period.

W. S. CALCOTT

E. I. DU PONT DE NEMOURS AND CO.,
WILMINGTON, DEL.

BOOKS RECEIVED

MONTAGU, M. F. ASHLEY. *An Introduction to Physical Anthropology.* Illustrated. Pp. xiv + 325. Charles C Thomas. $4.00. 1945.

QUIRING, DANIEL P., BEATRICE A. BOYLE, ERNA A. BOROUSH and BERNARDINE LUFKIN. *The Extremities.* Illustrated. Pp. 7 + 117. Lea and Febiger. $2.75. 1945.

OSBORN, CHASE S. and STELLANOVA OSBORN. *Errors in Official U. S. Area Figures.* Pp. viii + 177. The Science Press Printing Company. 1945.

SCIENCE NEWS

Science Service, Washington, D. C.

HURRICANES

AMERICAN hurricanes, that bring such destruction each year to property in the Gulf and Atlantic coastal states and to vessels in the neighboring waters, are similar in origin, action and direction of movement to the typhoons of the west Pacific which American forces will experience before the summer is over. They are destructive whirling masses of air, heavily laden with water, on opposite sides of the earth but both north of the equator.

The season for both hurricanes and typhoons is about the same, the summer and early fall months. Both originate over the oceans a little north of the equator in the regions where the trade winds are dying out and merging into the doldrums or calms. They usually form when the equatorial calms reach their most northerly extension. The heat and moisture of the doldrums are contributing factors.

The Caribbean Sea is usually regarded as the breeding place of the American hurricane. The Caribbean and the Atlantic to the east is more correct. The 50- to 100-mile-wide circular movement of air moves westward due to the deflective force of the rotation of the earth, then to the north and the northeast. The forward motion is relatively slow, 10 to 25 miles per hour, but the whirling movement of the air in the storm may be over 100 miles an hour. They may travel northward across the gulf of Mexico to strike the coast of Texas and Louisiana, or farther east to strike the gulf coast of Florida. Frequently they pass along the east coast of Florida and northeasterly along the Atlantic coast.

The most destructive American hurricane of modern times was the one in 1900 that destroyed Galveston, Texas, and took some 6,000 lives. Florida has been the southern scene of the most destructive ones since then. A hurricane in September, 1939, extended into New England, took a toll of about 500 lives and destroyed millions of dollars worth of property in the six New England states and on Long Island.

Heavy rain usually accompanies a hurricane. Heavy rain and high tides caused much of the loss of life in the Galveston disaster. More than 24 inches of rain fell in 24 hours during a hurricane in North Carolina. This is the heaviest recorded rainfall in a single 24-hour period in the United States.

The origin of the name, hurricane, is not certain. Columbus was probably the first white man to encounter the West Indies or American storm now known by that name. He, or some of his followers, learned the native Carib name, which was "huracan" on some of the islands, and "furacan" on others. Only the spelling beginning with "H" survived the sixteenth century. Whatever the original name, the American hurricane and the west Pacific typhoon can be known as twin brothers.

ITEMS

FOR the second time in just a day over two months, an astronomer named du Toit, on the staff of the Harvard Observatory at Bloemfontein, South Africa, has picked up a new comet. The discovery was made at 3:00 A.M., Greenwich time, on June 11, which is the equivalent to 11:00 P.M., EWT, June 10, in this country. The preceding du Toit comet was first observed on April 9. The new du Toit comet is an inconspicuous object, of only tenth stellar magnitude, and thus invisible to the naked eye. Its position, in the southern hemisphere constellation of Sculptor, puts it out of reach of telescopes in this country. Its position when discovered was in right ascension 1 hour 8 minutes, declination minus 20 degrees—celestial equivalents of longitude and latitude. A check on its motion showed that it was traveling fairly rapidly in a southwesterly direction.

A LARGE-SCREEN television receiver for the home and an improved radio-phonograph with a new electronic reproducer, both displayed recently for the first time, will bring better pictures after the war to homes and a realism never before obtained in recorded music, it is claimed. Both are developments of the General Electric Company. The television receiver produces a picture on a screen 16 by 22 inches and has several features that give brilliance and contrast not obtained by prewar receivers. It uses a five-inch cathode ray tube, a parabolic mirror and a correcting lens to project the picture to a flat mirror and then to the screen. While additional improvements may later be made, it is now a satisfactory receiver that can be produced commercially as soon as war conditions permit. Technical details of the postwar radio-phonograph have not yet been released, but superior performance is accomplished by improvement of all elements of the phonographic system from pick-up to loudspeaker. More perfect tonal balance is achieved at both high and low volume, and the reproduction is free from chatter, needle radiation and scratch prevalent in former machines.

PEANUTS, long regarded lightly as of interest only to small boys and circus elephants, are steadily rising in the scale of industrial and agricultural respectability. The U. S. Department of Agriculture is finding new and more efficient uses for them, in addition to their already big-business role as producers of a high-grade vegetable oil. The high-protein meal left after oil extraction has long been used as livestock feed; but now industry comes forward to compete with livestock for a share of it. Peanut protein has been found useful in adhesives, paper sizings and fabric coatings, by chemists at the Southern Regional Research Laboratory in New Orleans. The sugary liquor remaining after protein extraction can be used as a culture medium for a food yeast, thereby providing an additional source of protein for livestock feeding. At the Northern Regional Research Laboratory in Peoria, Ill., chemists have developed a method for using ground-up peanut hulls instead of ground cork as a basis for crown cap liners for bottles.

SCIENCE NEWS

Science Service, Washington, D. C.

THE MINERAL SUPPLIES OF THE WORLD

THAT equal access to the world's minerals for all peaceful nations lies at the heart of the problem of world peace has recently been pointed out by Dr. Charles K. Leith, professor of geology at the University of Wisconsin and government consultant. He stated that wise administration must be devised to withhold the minerals so necessary to war-making from nations that threaten the peace of the world.

He pointed out that "Minerals are irreplaceable assets which are being depleted at an alarming rate. No nation has enough of all commercial minerals. The United States is better supplied than any other nation, but during the war it has had to import about seventy varieties of minerals. Interdependence of nations as to minerals is a physical fact, not a theory.

"Since the first World War, as nations have realized the overwhelming importance of mineral supplies both for their future industry and for their security, there has been a world-wide scramble to control them, resulting in growing international friction. The degree of success in acquiring mineral supplies measures war-making power in these days of mechanized war. There now looms before us the problem of equal access to the world's minerals."

Dr. Leith emphasized the fact that an adequate answer to world mineral control will require not only international cooperation based on goodwill, but a very high order of scientific fact-finding and analysis. He pointed out that "The United States and the British Empire have been leaders in the development of the world's minerals," and that "Between them they control politically and commercially nearly three fourths of the world's known mineral reserves. Whatever their attitude may be it is obviously a critical factor in finding an answer."

Dr. Leith spoke during the intermission of the New York Philharmonic Symphony broadcast over CBS sponsored by the U. S. Rubber Company.

ITEMS

A HUNDRED and fifty scientists from 17 foreign countries have joined nearly a thousand Soviet scientists in attending special sessions celebrating the two hundred and twentieth anniversary of the foundation of the Academy of Sciences of the U.S.S.R. Foreign countries represented are the United States, Great Britain, France, Canada, China, India, Australia, Poland, Czechoslovakia, Yugoslavia, Bulgaria, Rumania, Mongolian People's Republic, Iran, Hungary, Sweden and Finland. As an evidence of the esteem in which scientists are held in the Soviet Union, the Soviet government conferred the title of hero of socialist labor on thirteen members of the academy and decorations on a large number of scientific workers.

OVER forty standard specifications for electronic equipment have now been approved and adopted by the Joint Army-Navy Electronics Standards agency, which passes on specifications for both branches of the service, with the result that electronic equipment suitable for use in all parts of the world is available to the armed forces. The former urgent need for standard specifications, and the work of the Army-Navy Standards agency, was presented recently at a meeting of the American Institute of Electrical Engineers by Captain J. B. Dow, U.S.N. The agency was established in December, 1943. After preliminary drafting, the specifications prepared by it, he explained, are processed independently by the Army Signal Corps and the Navy Bureau of Ships. The final draft is based on the reports from these two, after the industry and the War Production Board has had an opportunity to make recommendations.

VERY thin films of stainless steel, which have a degree of transparency, placed in front of the wide-angle lenses used in aerial photography, furnish the solution to a former difficult problem. Heretofore in using wide-angle lenses a "hot spot" in the center of the field of vision resulted in pictures bright in the middle but dark at the edges. The Bausch and Lomb Optical Company has developed a vignetting filter consisting of a disk of optical glass on which a film of stainless steel was deposited by a special electro-vacuum precipitation process. Placed in front of the lens, the film is thickest and transmits least light at the center of the disk, becoming gradually thinner and more transparent toward the edge. By complementing the characteristics of the photographic lens with which it is used, the filter permits photographs of ordinary density distribution.

LIGNIN, a by-product of pulp and paper mills that has long been regarded as "the largest waste in industry," is now found useful with fertilizers to add humus and organic matter to deleted soils, according to Robert S. Aries, research associate at Yale University. This new use of lignin, he says, is an "extremely important discovery, because of the tonnage involved." Lignin is an organic substance which, with cellulose, forms the chief part of woody tissue. In addition to 2,000,000 tons of lignin now discharged annually by mills into streams and rivers, he asserted, sawmills and other woodworking plants throughout the country "can readily make available another 10,000,000 tons of wood waste which can readily be incorporated into fertilizers." "As a result of present-day experiments, lignin may assume an important part in this nation's soil-building and conservation program. It will be a 'wealth from waste' movement, since lignin at present pollutes the nation's rivers; as fertilizer, it will definitely aid in providing higher land values and richer soils." The part played in soil improvement by using lignin with fertilizers is largely to supply organic matter. "If lignin is used on presently fertilized soils which need humus and organic matter, it is estimated that the efficiency of these soils would be raised about 20%," he said.

SCIENCE NEWS

Science Service, Washington, D. C.

TRAVEL BY AIRPLANE

AIR-MINDED America will have ample aircraft in the near future for passenger travel, air express and mail. Nearly three times as many planes, with nearly six times the seating capacity, will be available for commercial uses as there were before the war when 409 new planes, now on order or on option, are ready for use. All 19 American airlines are increasing their facilities.

These 19 airlines of the United States expect to have 975 planes in their postwar fleets, it is revealed by the Air Transport Association of America. The planes will seat 36,180 passengers. They will provide greater speed, comfort and service than air passengers have ever experienced before. The additional planes will be new, not converted surplus military transports. It has been found, the association states, that the cost of conversion of military transport planes is greater than the cost of new equipment.

The giant of the new planes under order is a 320,000-pound craft, powered with six 5,000 horsepower engines, seating 204 passengers, and with a cruising speed of 340 miles an hour which will enable it to travel from New York to London in nine hours. A new Mars-type 165,000-pound flying boat, four-engined, carrying 106 passengers, will be able to cruise at over 200 miles an hour with a payload of 28,000 pounds for more than 3,000 miles.

Other new planes will have seating capacities ranging from 128 down to 14 passengers. Some will have cruising speeds up to 325 miles per hour. Several will weigh 100,000 pounds or over.

The new planes for overnight trips will have different combinations of staterooms, berths and reclining chairs. They will have separate rest rooms for men and women. Wherever necessary all planes will have pressurized cabins to maintain low-altitude conditions at "over-the-weather" heights, together with air-conditioning, thermostatic temperature control, and individual ventilation. Windows will be larger and better arranged for observation. Electric stoves and refrigeration will permit the serving of satisfying meals.

Many scientific war developments that gave American war planes advantages over those of the enemies will be incorporated into the new civilian commercial aircraft. Among these are radar and electronic devices which permit landing under practically zero ceiling and visibility, and avoid risk of collision by enabling pilots to see other planes even in the thickest weather.

Among the new instruments is the Sperry "Gyrosyn" compass, which is a gyro synchronized with a magnetic compass, giving much greater accuracy in navigation. Also there is a far-advanced, radio-aided system of airway traffic control, which will be vital when planes are landing and taking off six a minute at the larger airports.

ITEMS

QUACK grass or couch grass, notorious as an evil weed in America as well as in its native Europe, has a possible use in animal feeding, according to experiments reported in *Nature*. The research was performed by W. King Wilson, of the Harper Adams Agricultural College at Newport, Shropshire. Quack grass spreads over the ground by means of quick-growing runner-like stems or rhizomes. It can be slowed, though not stopped, by pulling these loose with a rake and stacking them up to dry. But this of course involves labor costs, and no offsetting use has ever been suggested for the dead weed growths. Mr. Wilson made chemical analyses of dried quack-grass rhizomes and found that the food substances in them compared favorably with those in ordinary hay. Then he substituted them for hay in the diet of a group of rabbits, and found that the animals throve at least as well as those of a similar group kept on hay. Quack grass has a number of aliases, though they all sound more or less alike: quick grass, couch grass, twitch grass. To botanists the weed has only one name: *Agropyron repens*.

VEGETABLE produce shipped bedded down in finely granulated ice keeps its freshness, crispness and vitamin C content over a longer period, researches conducted in twenty-one colleges throughout the country have shown. "This method of refrigerating produce with snow-ice is like the protective effect of the late spring snows on vegetation," Charles F. Belshaw, research consultant of the National Association of Ice Industries, said recently, speaking as guest of Science Service, on the CBS program "Adventures in Science." Researches show that vitamin C retention in foods is essential in the retention of flavor and that keeping vegetables fresh through use of snow-ice will bring food to the dinner table so that it tastes better and is nutritionally better. Whole blood is shipped successfully across the Pacific in an insulated container in which the bottled blood is placed in racks around a large compartment of cracked ice, Mr. Belshaw said. Although temperatures inside planes in the Pacific often go as high as 130 degrees, this method keeps the blood to be used in treating the wounded at a temperature between 40 and 45 degrees which is necessary to keep it in usable condition.

THAT alumina, the common oxide of aluminum, which is used as an essential ingredient of super-duty spark plug insulators, high-temperature refractories and insulators in the field of electronics, has a lower melting point than previously supposed, has now been determined by the National Bureau of Standards. As a result of recent measurements made by R. F. Geller and P. J. Yavorsky, of the bureau staff, the melting point of alumina has been determined as lying within the range 3,630 to 3,690 degrees Fahrenheit. This is lower than the value usually quoted, 3,720 degrees. A reasonably accurate knowledge of the melting point of this material is important because of its wide industrial uses. Three samples containing over 99.9 per cent. of alumina were used in the tests. They were heated in an oxidizing atmosphere in an electric furnace, and the temperatures determined by means of an optical pyrometer.

SCIENCE NEWS

Science Service, Washington, D. C.

THE CONTROL OF AIR TRAFFIC

EXTENSIVE planning is now under way by officials concerned with LaGuardia Field on Long Island, New York City's great airport, for controlling sky traffic because of the enormously increased use of the field expected in postwar days. This means particularly radio communication with approaching planes, instructing them relative to weather conditions, what air levels to use, and when and where to land.

LaGuardia field is now one of the largest and busiest traffic control centers in the world, according to the U. S. Civil Aeronautics Administration. But, it says, a tremendous increase in business after the war may be expected, and preparations for it must be made now.

"New York's problem is complicated," the Administration states. "Here, at LaGuardia Field, is a mixture of foreign traffic entering the streams of domestic traffic coming from every part of the continent centering at the country's greatest metropolis. New York is now, and will be increasingly, the terminus for intercontinental traffic."

Controlling sky traffic becomes increasingly important in bad flying weather. When instruments were developed to enable pilots to fly through storms and cloudy weather conditions, traffic control along the airways became necessary. Now, with many planes in the air in all kinds of weather, and scores converging on a spot like New York and other great American fields, the pilot must be helped to the ground.

The pilot must be given information by radio relative to weather conditions and landing conditions, and must be instructed at which thousand-foot level to approach, when to drop a thousand feet to a lower level, and when and on which strip to land. Three kinds of government workers perform these services, air traffic controllers, meteorologists and aircraft communicators.

These men rarely see the planes whose progress they chart and direct along the airways of the world. They sit before inclined posting boards with movable cards on which are recorded radio reports of planes received from pilots when miles away. As the planes approach the cards are moved downward on the board, and off the board when the plane lands.

New York's station handles both overseas-foreign and interstate-domestic communications, distinguishing it from others of the 400 stations operated by the Civil Aeronautics Administration. The big gun of the station is the intercontinental transmitter WSY at Sayville, Long Island. All overseas communication is handled by the administration.

ITEMS

THE amount of ascorbic acid, or vitamin C, in tomatoes —the most important vitamin of this fruit—varies directly with the light intensity in the growing areas, is indicated by studies in the U. S. Plant, Soil and Nutrition Laboratory of Cornell University. Of this discovery, Dr. L. A. Maynard, director of the laboratory and head of Cornell's School of Nutrition, said, "investigators believe that it will be worth while to chart areas where commercial production will yield the highest vitamin content in this important food." In the tomato research, studies by Dr. W. L. Nelson showed first of all that tomatoes as marketed vary widely in their content of ascorbic acid. Dr. Karl C. Hamner and Dr. G. F. Somers then found that most variations resulted from differences in light intensity prior to harvest. In a recently completed study, the tomatoes grown in one area had one third more ascorbic acid than the same variety grown in another nearby area. A light-measuring device showed that those grown in the first section were subject to one third greater light intensity.

INCREASING the family's vitamin A consumption is good for young and old, it appears from studies of rats reported by Dr. H. C. Sherman and Dr. H. L. Campbell, of Columbia University, to the National Academy of Sciences. Liberal intakes of this vitamin, found in such foods as butter, liver, egg yolk, carrots and green leafy vegetables, tends to postpone aging and increase length of life, Dr. Sherman and colleagues have previously reported. Now they find that the offspring in rat families on the liberal vitamin A intake grow somewhat more rapidly and with less individual variability. This indicates that liberal vitamin A has both a favorable and a stabilizing influence on growth. This favorable, stabilizing effect on rat growth was observed with vitamin A intakes two and four times higher than the intake considered fully enough to meet the rat's nutritional needs.

USE as a water softener of New Jersey marl or greensand, formerly important as a fertilizer, has inspired a program of rehabilitation and expansion for New Jersey's mineral industry which has dwindled in output, income and employment in recent years. A new bureau of mineral research at Rutgers University, headed by Dr. Alfred K. Snelgrove, formerly of the Michigan College of Mining and Technology, will conduct the study.

GROWING plants in glass flowerpots will feed on the walls of the pots themselves if they are made of a new nutrient glass fertilizer. The glass will supply all the necessary food elements except nitrogen, organic matter and water. This use is suggested by A. E. Badger and R. H. Bray, of the department of ceramics engineering of the University of Illinois, as one of the results of work carried on on the solubility of fused mixtures of rock phosphate, potassium carbonate and silica. Should proper solubilities be obtainable with the more complex mixtures, these scientists state, and costs be competitive with present fertilizers, glass fertilizers may offer interesting advantages. The ease with which glass can be manipulated, the scientists say, suggests many commercial adaptations for soilless growth experiments as well as ordinary applications for soil enrichment.

SCIENCE NEWS

Science Service, Washington, D. C.

RED STARS

VERY red stars whose spectra show an abundance of titanium oxide and carbon compounds show a special distribution in our part of the galaxy. These conclusions have been set forth in a recent report by Dr. Oliver J. Lee, director, and Thomas J. Bartlett, of the Dearborn Observatory of Northwestern University.

The titanium oxide stars, known to astronomers as types M5 to M8, are more easily detected and classified on plates made at the observatory than any other stars, so if others had been present in the regions studied, they undoubtedly would have been identified during the Dearborn survey of faint red stars.

The second of three parts of the survey has just been announced in the Annals of Dearborn Observatory. So far nearly one third of the total area of the sky, or about 14,000 square degrees, has been studied.

M-type dwarf stars of absolute magnitude 9.7, which means stars only about 1/100 as bright as the sun, have been observed to a distance of about 123 light years, or 722,000,000,000,000 miles away. Ordinary giants and supergiants located hundreds of times farther away were also studied. Thus these giants have been hunted far and wide, and if they are well distributed in our galaxy, considerable numbers should have been recorded on the photographic plates as faint stars.

Among the 22,680 stars which have been catalogued thus far at the observatory only 1,499 were of the advanced titanium oxide type.

Because of the foregoing considerations, and because of the relatively high concentration of carbon stars in the anticentric regions of the Milky Way, several questions which would bear further investigation have occurred to the Dearborn astronomers:

Does our branch of the Milky Way have an unusually abundant supply of carbon and its compounds? Is this true also of the titanium oxide molecules in stars of advanced M type?

If so, is this due to quite irregular distribution of those cosmic materials or does our part of galactic space have properties which tend to make them more favorable materials for building stars?

Is our branch of our galaxy a somewhat recently developed subdivision, or possibly a very old one, in which a carbon cycle and perhaps a titanium cycle have gone berserk and rule the destinies of stars for a brief period with complete abandon?

ITEMS

A NEWLY designed 30-passenger domestic postwar transport plane, to be built by the Consolidated Vultee Aircraft Corporation, will combine passenger comfort with operating efficiency. In this new Convair design, designated as Model 110, speed at low cost, safety and complete comfort for travelers are incorporated. It is expected to reduce airline operating costs to a minimum. The new Convair will be a low-wing, twin-engine monoplane with a cruising speed of 275 miles an hour, at least 95 miles an hour faster than the twin-engine transports in common use by domestic airlines. It will have a maximum speed of over 300 miles an hour. With a gross weight of 32,300 pounds, it will be able to carry an 8,000-pound payload of passengers, mail, express and baggage. Passengers will enter the new plane by means of a retractable stairway located beneath the tail. Luggage racks and a full-height coatroom are at the head of the stairs. Cabins will be finished in restful colors. Individually adjustable Polaroid windows will be used to reduce glare, spun-glass insulation will keep out engine noise, and custom-designed seats will provide passengers with comfort and an opportunity for relaxation.

THAT unit transportable electrical power plants, complete with generator, steam turbine, boiler and other necessary parts, are being shipped to Europe to furnish power in bombed-out regions to help the return to normal industrial production, is announced by William E. Knox, of the Westinghouse Electric International Company. The units are of two sizes, one with a capacity of 2,000 kilowatts, the other half as large. The idea of a compact power-producing unit first was conceived by Mr. Knox for use in China, following a trip to that country in 1939. The Chinese, forced back into the interior by the Japanese from their coastal industrial cities, needed a quick means of generating electric power for war production. Westinghouse designed units that could operate on locally abundant low-grade coal and models that were built to burn lignite, oil, wood and even peat. The European war created another demand. A semi-portable design was perfected that could be assembled in a minimum of time. To meet the emergency requirements of rehabilitation a design was made that simplifies the arrangement of the major parts and eliminates all dispensable refinements.

THE new insecticide, DDT, gives promise of eliminating barnacles from ships' bottoms and other marine structures. Barnacles failed to attach themselves in six months' time to wooden panels coated with a paint developed by Professor R. E. Dimick, of Oregon State College. This paint contained DDT, chemically dichlorodiphenyltrichloroethane, and no other known toxic substance. Control boards treated with the ordinary antifouling paints were heavily covered with barnacles and other salt-water fouling animals after three months' submersion in marine waters. The anti-barnacle paint was one of a large group tested at the Yaquina Bay Fisheries Laboratory operated by the Oregon Agricultural Experiment Station. Since DDT is insoluble in water, the expectations are that its antifouling properties may greatly exceed the initial test period of six months. Studies are being continued to determine the efficiency of DDT as antifouling agent for marine animal forms other than barnacles, as a control for wood-boring marine mollusks and crustaceans, and to ascertain if the insecticide exhibits differences in antifouling properties for the various species of barnacles.

SCIENCE NEWS

Science Service, Washington, D. C.

SOYBEAN OIL PRODUCTION

THE soybean is now Americanized, and soybean oil, its principal commercial product, is now manufactured in the United States in a quantity equal to that produced from cottonseed, which long was America's greatest source of edible oils. The soybean oil industry in America is only about two decades old, although imported soybean oil has been used for much longer than that. Wartime conditions greatly boosted production, but peacetime uses will probably keep up the present rate.

Soybean oil is used in the United States for shortening, margarine, other edible products, soap, paints and varnishes, linoleum and oilcloth, and in printing inks, but its principal use is in foods. Approximately 96 per cent. of the 1943 production was used in edible products, according to O. H. Alderks, of the Soybean Research Council, reporting in the new issue of *Chemical and Engineering News*, published in Washington by the American Chemical Society.

Some 891,000,000 pounds of soybean oil was used in 1943 in food products, he says. It has now replaced a great amount of cottonseed oil in shortening, the cottonseed oil having been shifted to other edible products. In margarine it has replaced all coconut, babassu and similar oils, and accounts for about 40 per cent. of margarine fats. In salad oils and cooking fats, 124,000,000 pounds were used in 1943, replacing the unobtainable coconut and palm oils of the Pacific area.

Soybean oil has a number of desirable qualities, Mr. Alderks states. It has generally low bleaching costs, whiter products, good rancidity behavior and good consistency behavior. Its undesirable characteristics are poor flavor stability, particularly of the lower-grade oils, and additional cost to hydrogenate.

Flavor stability will improve, according to Mr. Alderks, with an improvement in the entire soybean industry, beginning with improved farm practices, better and quicker harvesting, prompt drying when necessary, better storage and improved methods of oil extraction. Clean, fully matured, sound, fairly dry, yellow soybeans produce the best oil.

ITEMS

CHEMISTS are learning how to make new desirable substances by building up the kind of molecules desired, declared George R. Harrison, dean of science at the Massachusetts Institute of Technology, speaking during the intermission in the broadcast program of the New York Philharmonic Orchestra, sponsored by the United States Rubber Company. Only a few tens of thousands of different kinds of molecules have been identified as occurring in nature; now nearly a million new kinds of molecules have been produced, he stated. "Scientists have long known," he said, "that the best way to understand a material is to understand the molecules of which it is composed." In earlier days, he added, "chemists produced new substances by mixing chemicals together, letting them fizz more or less at random, and then seeing whether the new substance obtained had properties which would be useful. To-day, however, they are learning to figure out in advance how to build molecules which will have any desired property." The spectroscope is the instrument that has enabled chemists to find out how atoms fit together to make molecules, Dr. Harrison stated, adding: "This device has unlocked even more secrets of nature than have its companions, the telescope and the microscope."

A NEW safety fuel for aircraft, so resistant to accidental ignition that a lighted match can be dropped in without causing a fire, has been announced and its properties demonstrated in New York to a group of scientists. It has all the power of 100 octane fuel, extended tests in a high-powered airplane engine show. The new safety fuel is a development of the Standard Oil Company of New Jersey, and the demonstration was made by technical men of that company and of Pan American World Airways. The chief engineer of the latter company pronounced it to be "an important technical advance in aviation." The safety feature of the new fuel is due to the fact that it does not form inflammable vapors in the air in great enough quantities to ignite, unless it is at temperatures above 100 degrees Fahrenheit. Ordinary motor and aircraft gasolines do, and they ignite readily and burn rapidly because of the vapors formed. The new fuel, however, must be fed into the engine by direct injection rather than by ordinary carburetion such as is used with conventional gasolines. Unless suitable carburetors are developed, engines now in use will have to be converted for fuel injection if the new fuel is to be used. After the fuel is injected in the cylinder, it is vaporized by the heat developed during compression. The fuel mixture is fired by the conventional spark plug.

A NEW comet, named du Toit for its discoverer, has been speeding across the heavens during the past two months. The faint comet, discovered by a member of the Harvard Observatory staff at Bloemfontein, South Africa, has been watched by astronomers in South Africa as it traveled from the constellation of Leo, the Lion, to Hydra, the Water Monster. In April, Harvard's South African Station radioed that the tenth magnitude comet had been discovered on April 9. As the object was not found on plates of the region made at the Harvard Observatory here, however, Dr. Harlow Shapley, director of the observatory, withheld announcement and wrote for confirmation. Harvard has received a second radio message, presumably in reply to Dr. Shapley's letter, stating that the new comet had been observed continuously for two months by both the Boyden Station at Bloemfontein and the Union Observatory at Johannesburg. Dr. J. Jackson, director of the Royal Observatory of Capetown, has computed the approximate orbit of the comet which now, however, has become so faint as to be beyond the limit of the ten-inch photographic telescope.

SCIENCE NEWS

Science Service, Washington, D. C.

DDT ROTENONE SPRAY

SPRAYING with DDT and rotenone mixture provides a practical and economical solution of one of the major problems of cattle raisers in tropical and sub-tropical regions, control of cattle ticks, it was announced at the Third Interamerican Agricultural Conference by Dr. Earl N. Bressman, Director of the Interamerican Institute of Agricultural Sciences. It is expected that the new method will be applicable from the northern provinces of Argentina to the southern United States.

Cattle-dipping vats, which have been widely successful in tick control in temperate regions, have had considerably less success in the tropics, for a variety of reasons. Over large areas the necessity of depending on relatively untrained personnel resulted in high mortalities because of poorly designed dipping vats, arsenic poisoning of cattle, mechanical abortion and other injuries. Furthermore, the intense tropical heat often caused deaths from overheating, especially in the case of animals that had to be driven long distances to the vats—which often cost in the neighborhood of $4000 each—and the cattle suffered from decreased milk production and, in the case of the ubiquitous oxen, from lack of rest following dipping.

After 110 experiments over a period of three years, Dr. Robert L. Squibb, of the Division of Animal Industry of the institute, developed a new spray solution, specific for use against the cattle tick, a mixture of DDT and rotenone. One hundred cubic centimeters of the solution is sufficient, used as a fine spray, to cover an animal, at a cost of as little as one half cent, depending on local conditions. A wide variety of spraying equipment, ranging from a hand-operated flit gun to power equipment, secures equally effective results. A tick mortality of 95 per cent. has been recorded from animals with an infestation of as high as 40 ticks per square inch.

Length of effectiveness of the treatment varies with climatic conditions, as does cattle dipping, and the solution has continued to give protection against the ticks up to 80 days. Spraying between the animals' legs and in body crevices is not necessary since once engorged ticks have dropped off, the animal is not reinfested during the period of spray effectiveness. More than 7,000 applications have been given over a period of nine months, with no indication of a poisonous tendency.

ITEMS

A NEW platinum material, for laboratory ware such as crucibles and other articles now made of platinum alone, has been developed and is a combination of all platinum-family alloys. The new product, developed because of war necessity and now thoroughly tested in actual use, is claimed to be superior to the platinum ware it may replace. The new material is a product of the Oscap Manufacturing Company, and it has been tested over months in Army, industrial and university chemical laboratories, and found satisfactory in all, it is said. The color of the new material is the silver gray of regular platinum, but slightly darker. It is non-oxidizable, has high tensile strength and flexibility, and is resistant to all acids except boiling aqua regia, a mixture of concentrated hydrochloric and nitric acids.

A NEW non-petroleum lubricant for automobiles, aircraft and other internal combustion engines has been developed and tested that is claimed to have unusual advantages over mineral oil, particularly in cold weather. Its properties are quite different in many respects from oils derived from petroleum. It is wax-free and can be made to any desired viscosity. The lubricant is a product of Carbide and Carbon Chemicals Corporation and is now being produced in commercial quantities. Its use in engines has been studied for several years in a large number of vehicles. Large quantities are in use in military equipment, and, at the present time, sale of the material is limited to war uses. No petroleum oils are contained in the new lubricant. It has a density approximating that of water. It is characterized by low change in viscosity with change of temperature. Carbon residue values are very low. Sludge and varnish formation in the engine is practically eliminated when the new lubricant is used, and wear of moving parts is in line with wear experience with ordinary mineral oils.

A COAL tar fuel widely used in the United Kingdom during the war years, and still in use, has been described by the Ministry of Fuel and Power. It is a creosote-pitch mixture, with about equal parts of the two substances, and is made entirely from English-produced materials. The 50–50 creosote-pitch fuel mixture is homogenous, and the so-called free carbon consists of microscopic particles of resinous material, which, when the fuel is held in storage at from 80 to 90 degrees Fahrenheit, remain permanently dispersed. Heating equipment formerly used with other liquid fuels can be used with this coal tar product, provided certain minor adjustments are made. If used with petroleum fuels, the equipment must be thoroughly drained and flushed with hot creosote oil, because if petroleum fuels are allowed to mix with tar fuels, the resinous matter in the latter is immediately precipitated.

AN electrical instrument, so sensitive that it can measure movements, or changes in position, as small as one-tenth of a millionth of an inch, has been developed at the Battelle Memorial Institute, Columbus. It is a tool to measure the position of either slowly or rapidly moving objects without touching the object itself. Its first practical application was in measuring the errors in high-precision lathe spindles used in machining aircraft motor parts. The instrument is also the heart of an apparatus for measuring and recording the changes in crystal structure when steel is heated rapidly, as in electric welding. Other possible, but as yet undeveloped, uses of this electrical micrometer are as a meter to indicate the power output of airplane engines in flight, and as a means of measuring roughness and hardness of metallic surfaces.

SCIENCE NEWS

Science Service, Washington, D. C.

TELEVISION BROADCASTING FROM AIRPLANES

TELEVISION broadcasting from stations in the sky six miles above the earth, in airplanes slowly cruising in circles, will be tested as soon as permits and equipment can be obtained, has been announced by the Westinghouse Electric Corporation. Initial flight tests of the system, known as Westinghouse Stratovision, are expected to be made this fall.

The system would employ a low-powered ground transmitter to send television, and frequency modulation broadcast waves, to a specially designed high-altitude plane encircling overhead. The plane would be equipped with receivers and transmitters for re-broadcasting the programs back to the earth.

The advantages to be gained by this television broadcasting from the stratosphere are wide coverage and relatively low cost over other systems proposed. Television and FM waves travel in a straight line and for all practical purposes, according to Walter Evans of Westinghouse, stop at the horizon. This means, he says, that television broadcasts from the highest practical tower erected on the ground can not be received much more than 50 miles away.

"The Stratovision system," he explains, "simply puts the antenna and transmitter in an airplane flying in lazy circles 30,000 feet above the earth, out of sight of human eyes. The shortwaves sent out from this airborne antenna would blanket the earth's surface like a great inverted ice cream cone, covering an area 422 miles across or equal to the combined area of New York, Pennsylvania and New Jersey."

Eight such stratovision planes properly positioned would give television and FM coverage from coast to coast. Mr. Evans states that to provide comparable service by ground installations would require approximately 100 costly relay towers and hundreds of transmitters; or a coast-to-coast coaxial cable network which is estimated to cost at least $100,000,000. The addition of six more planes in the right places would provide Stratovision coverage for 51 per cent. of the nation's area and 78 per cent. of its population.

A special slow-speed plane, almost as large as the B–29, has been designed for the stratovision system by the Glenn L. Martin Company of Baltimore. Present plans call for a conventional all-metal, low-wing monoplane with automatic pilots, turbochargers and supercharged cabins.

ITEMS

THE term electron-volt, once used principally by physicists doing research with the atom, is now a commonplace in newspaper pages. It is a measure of energy. The energy of a moving automobile—the force with which it might hit another object—depends on both the weight of the car and the push or the force with which it is impelled. In the same way, the electric energy of an atomic particle depends upon its mass and the potential or the push which impels it. In the case of the automobile the energy is measured in foot-pounds. In the case of the atomic particle, the unit is the electron-volt and is that which is given to a single electron by an electrical push amounting to one volt. The push that lights your electric light is usually 110 volts. Millions of volts are used in artificial lighting and atom research.

SMALL airplanes may be easier to fly as a result of the development of a new controllable-wing plane now undergoing exhaustive tests at Stout Research Division in Dearborn, Mich. This experimental plane is built so that the position of the wings in relation to the fusilage may be changed at will by the pilot. Advantages of the controllable wing appear to be that it will result in greater safety and easier handling of personal aircraft. The controllable wing eliminates the necessity for ailerons, elevators and rudders. Several years may be required to develop the wing before it can replace the conventional type, reports I. M. Laddon, vice-president in charge of engineering of Consolidated Vultee Aircraft Corporation, parent company of the Stout laboratories. The controllable-wing plane was developed by George Spratt, who piled up 100 hours of secret flying with his new plane before friends knew he could fly.

HORSESHOEING will be the postwar work of some expert electric arc welders now building ships if a modern method of shoe repairing followed by a veteran blacksmith becomes a general practice. The welding blacksmith repairs shoes while still on the horse's hoof, building them up or adding spurs to prevent slipping, by arc-welding strips of metal or caulks on them. Most horses do not object to the new procedure. Old shoes can be built up this way a couple of times, Charles H. Chism, Coshocton blacksmith, has found through tests. The heat of the arc or of the heated shoe does not affect the animal. In fact, the shoe during the welding process is not as hot as the shoe in the ordinary fitting process which is placed while almost red hot against the hoof to burn it enough to get a good fit. When the welding is completed, shoe and hoof are cooled with water. Some horses are disturbed by the flash of the arc but are not troubled if a blanket is thrown over their heads.

THAT alumina, the common oxide of aluminum, which is used as an essential ingredient of super-duty spark plug insulators, high-temperature refractories and insulators, in the field of electronics, has a lower melting point than previously supposed, has now been determined by the National Bureau of Standards. As a result of recent measurements made by R. F. Geller and P. J. Yavorsky, of the bureau staff, the melting point of alumina has been determined as lying within the range 3,630 to 3,690 degrees Fahrenheit. This is lower than the value usually quoted, 3,720 degrees. A reasonably accurate knowledge of the melting point of this material is important because of its wide industrial uses.

SCIENCE NEWS

Science Service, Washington, D. C.

"CANNING" URANIUM SLUGS

LEARNING how to "can" uranium slugs was one of the most difficult problems encountered in making atomic bombs, Dr. H. D. Smyth, of Princeton University, consultant on the project, relates in the technical report released by the War Department. The failure of a single "can" might have caused an entire operating unit to be shut down.

The most efficient way of cooling the uranium would have been to let the water flow in direct contact with the radioactive metal in which the heat was being produced. This seemed out of the question, however, since uranium would react chemically with the water. It was feared direct contact between the two would put a dangerous amount of radioactive material into solution and probably even disintegrate the uranium slugs.

No one who lived through the period of design and construction of the Hanford, Wash., plant is likely to forget the problem of sealing the uranium slugs in protective metal jackets, according to Dr. Smyth. The state of the "canning problem" could be roughly estimated by the atmosphere of gloom or joy to be found around the laboratory.

A sheath had to be found that would protect uranium from water corrosion, keep fission products out of the water, transmit heat from the uranium to the water and not absorb too many neutrons.

Metal jackets or cans of thin aluminum were feasible from the nuclear point of view and were chosen early as the most likely solution of the problem, but alternative ideas continued to be explored. Both the problem of getting a uniform heat-conducting bond between the uranium and the surrounding aluminum, and that of effecting a gas-tight closure for the can proved troublesome.

Even up to a few weeks before it was time to load the uranium slugs into the pile there was no certainty that any of the processes under development would be satisfactory. A final minor but apparently important modification in the canning process was adopted in October, 1944, and up to the time the report was written there had been no canning failures.

ITEMS

AN electronic navigator for ocean, lake and river ships, that will detect above-water obstacles such as other vessels, icebergs, land, lighthouses and buoys by radar, is under test on shipboard by the U. S. Maritime Commission, it is now announced. It will detect these obstacles through darkness, fog and storm at distances up to 30 miles, depending on the size of the object. The tests are being made on the SS American Mariner, training ship of the WSA's Maritime Service training program. Additional sets will be placed soon on other vessels. When materials are available the equipment will be obtainable by commercial shipping, both on inland waters and on the sea. The device operates on the radar principle of radio waves which are reflected from objects and are measured to give true bearing and distances of the object from the point of sending. It has a rotating antenna, located on top deck of the vessel, sending out powerful radio microwaves capable of penetrating fog or other atmospheric conditions. If these pulses hit an object, some of them are reflected back to the rotating antenna, which also contains a receiving antenna. The apparatus is an adaptation of radar equipment that has served a valuable war purpose. The set under test was developed by the General Electric Company laboratories at Schenectady, N. Y.

WITH the return of heavy automobile traffic to the nation's highways, drivers in three additional states will find themselves operating under financial responsibility laws to protect innocent parties in case of accidents. These three, Nebraska, Minnesota and Georgia, have enacted such legislation during the present year. Some thirty-two others had previously passed such laws. The main features of the Nebraska and Minnesota legislation are similar. In accidents involving more than $50 damages, the driver and owner must pay the damages within sixty days, or forfeit driving license. Reinstatement of the license is contingent upon the driver taking out an insurance policy or equivalent bond to cover future accidents. Under the Georgia law, the driver against whom damage claims are assessed by the court must pay in thirty days or have his license suspended. It is not returned until the licensee has taken out liability insurance. Nine other states have legislation similar to these three, according to the Public Administration Clearing House of Chicago. Some of the other states have laws much more severe. The Massachusetts statute is the most stringent. In that state a driver must obtain responsibility insurance before any permit to drive is issued to him.

MUSTARD seed is now scattered by airplanes over fire-devastated mountainous areas in California to start a quick growth to form a cover to prevent soil erosion. Of a hundred kinds of seeds tested for this purpose, black mustard proved most desirable. A report relative to the use of mustard seed to prevent erosion on burned-over areas in California has been issued by the U. S. Department of Agriculture. Erosion of many of the California hill and mountain soils is extremely severe if the chaparral or forest cover is destroyed by fire. The problem is to restore growing plants to cover the soil with their leaves and hold it with their roots before rain can get in the soil and wash it away. The black mustard seed is satisfactory because it is light and fine, and smooth so that it settles rapidly and evenly when blown from a plane. It sprouts quickly with even slight moisture and roots rapidly. Its first growth is a rosette of leaves that forms a protective pad at the soil surface. It is an annual that reseeds well, but dies the first year and forms a litter of dead tops.

SCIENCE NEWS

Science Service, Washington, D. C.

DISINFECTION OF SCHOOLROOM AIR BY ULTRAVIOLET LIGHT

THE ever-difficult problem of hygienic schoolroom ventilation may be solved by ultraviolet light, it appears from a report of Dr. Mildred Weeks Wells, of the School of Medicine of the University of Pennsylvania, in the *Journal* of the American Medical Association.

"School ventilation, which has necessarily been curtailed on account of fuel shortages during the war, will probably never return to prewar standards. Enlightened opinion, which formerly opposed, on hygienic grounds, lowering the volume of air change, now recognizes the potentiality of higher standards of sanitary ventilation through air disinfection, which can practically provide the hygienic equivalent of ventilation impossible of attainment by actual air replacement."

The school ventilation standard of 30 cubic feet of air per minute per child is not only difficult to attain; it is not enough to prevent classroom spread of chickenpox and measles except in rooms where less than 40 per cent. of the pupils are susceptible to chickenpox and less than 20 per cent. are susceptible to measles.

In contrast to this, Dr. Wells found the chances of a susceptible child getting measles, chickenpox or mumps from a classmate can be definitely reduced by disinfecting schoolroom air with ultraviolet light.

Her conclusions are based on studies begun in the Germantown, Pa., Friends School in 1937 and subsequently expanded so that since the fall of 1941 they have included two neighboring private schools and two groups of public schools in Philadelphia suburbs.

Even better results may be attained with air disinfection as the result of the early experience with it. Proper servicing of the lamps is important. Teachers and pupils should understand how they work so as to avoid the mistake made in one school of draping the lights with autumn leaves and Spanish moss for the Thanksgiving festivities. This, of course, blocks the ultraviolet rays so they can not get at the germs in the air to kill them.

In a first grade outbreak of measles, nine little girls being infected from a classmate, the cause was apparently the fact that a playhouse was put into the schoolroom. This reproduced in miniature the exact situation the lights were designed to prevent. It gave a chance for germ-laden droplets of moisture from one little girl's breath to reach all the others without having been exposed to the germ-killing light.

When the air has a high relative humidity, as it may in fall before the heat is on, the ultraviolet light is less effective in killing germs. This difficulty may be unavoidable.—JANE STAFFORD.

ITEMS

FOREST conservation and expansion under a plan for international collaboration is recommended in a recent report to the United Nations Interim Commission on Food and Agriculture by that body's technical committee on forestry and primary forest products, according to Lyle F. Watts, a member of the committee and chief of the U. S. Forest Service. Forest conservation is a critical world problem, and must be solved if the world's supply of wood is maintained, the report states, in the face of a constantly shrinking supply and heavy demands. "The world is confronted," says the report, "with the inescapable fact that the forests—sole source of wood—are steadily diminishing. . . . To-day the world stands on the threshold of developments in the use of wood that may be as revolutionary as the invention of the steam engine or the introduction of technology to the farm." The technical forestry committee making the report is headed by Dr. Henry S. Graves, a former chief of the U. S. Forest Service and dean emeritus of the Yale School of Forestry. On it are representatives of Great Britain, Canada, Soviet Union, France, Norway, Brazil, Czechoslovakia and China.

PROPER dimensions for the ideal railway coach seat have at last been scientifically determined. Nearly 4,000 average American men and women passing through two great railroad stations can't be wrong. They voluntarily sat in a "measuring chair" in the two stations and answered unusual questions to furnish data from which the results were derived. The ideal coach seat should have a seat length of 20 inches and a back height of 28 inches, according to the findings. Elbow height should be 8.5 inches and hip breadth 19 inches. Shoulder breadth should also be 19 inches, and the height of the seat above the floor again 19 inches. The study was confined to chair dimensions and eliminated upholstery and other factors. The measuring chair, in which 3,867 persons sat in the tests in the two stations, was made here by the Heywood-Wakefield Company for the Chicago and North Western Railway, which sponsored the study. The actual investigation was made by Dr. E. A. Hooton, chairman of the department of anthropology of Harvard University.

NEW domestic developments in the application of aviation to sanitation and public health after the war are hinted in the use of a B-25 to spray DDT on Rockford, Ill., as a possible help in fighting an infantile paralysis outbreak in that city. So far as infantile paralysis goes, this spraying of the potent insecticide by air and the use of DDT by power sprayers from an Army truck are in the nature of trial balloons. Dr. John R. Paul, of Yale University, and some other scientists have for some years suspected that the common house fly might spread the infantile paralysis virus. The virus of the disease has been found in flies, but whether the disease actually is spread by them has not yet been proved. Through the Army's Epidemiological Board and the Air Surgeon's Office, the plane from Wright Field and Army DDT power sprayers and men who know how to use the latter were ordered to Rockford for the trial.

SCIENCE NEWS

Science Service, Washington, D. C.

TYPHUS, DDT AND MALARIA AND AFRICAN SLEEPING SICKNESS

DDT can send malaria mosquitoes, typhus lice and other disease-carrying insects to join the dodo and the dinosaur in the limbo of extinct species, thereby ending these particular plagues for all time.

This was the promise held out by the two Swiss chemists who started DDT on its present spectacular career as a killer of insects—Dr. Paul Lauger, technical director of the firm of J. R. Geigy, S.A., and Dr. Paul Muller, inventor of the DDT insecticides—at a press conference in New York City.

African sleeping sickness, spread by the tsetse fly, was another scourge mentioned as a possible candidate for extinction. The area in Africa that is now practically an unpopulated waste because of the menace of this terrible disease could be hemmed in by a cordon of DDT-armed insect-fighters, who would press constantly in upon the fly-infested terrain both in the air and over the ground, until the last acre had been mopped up.

Mass attacks of this kind, Drs. Lauger and Muller admitted, would cost money and take time; but the cost in either would be only a fraction of that demanded by war—and human lives would be saved, not recklessly spilled. Such campaigns would also be devastating to beneficial insects and other cold-blooded forms of life, they said, but they claimed these could repopulate the areas by inward dispersal from the unsprayed margins.

On a less sweeping scale, but still on a major field campaign basis, the two Swiss chemists pointed out how DDT can be used to combat some of our worst crop pests, like boll weevil and other cotton insects. These often constitute the bulk of the insect life of the large fields where the crops are grown, so that damage to beneficial insect populations becomes a less serious consideration.

DDT can even be used in warfare against dug-in insect enemies, it has been discovered. It can be used effectively in this way against the grubs or larvae of the Japanese beetle, though oddly enough it has not been found particularly poisonous to their close cousins, the big white grubs that grow up to turn into June bugs or May beetles. Another ground-dwelling pest that succumbs to DDT is the roundworm or nematode that causes root rot, a disease afflicting many plants.

For some of these mass attacks, DDT has been found a hundred times more effective than the arsenical poisons hitherto in use. For instance, 15 pounds of DDT per acre will be as effective against Japanese beetle larvae as 1,500 pounds of a standard arsenic compound applied to the same area, Drs. Lauger and Muller stated.

DDT can be applied by practically any method now in use with other insecticides. It is especially effective dissolved in Freon and released as an aerosol, but it also works well dissolved in kerosene or other light oils and used with ordinary spraying machinery. It is only slightly soluble in water, but oil solutions can be easily made into emulsions. Dispersed in inert powdered materials such as talc or kaolin, DDT is an excellent crop-dusting medium.

One of the most promising carriers for household use of DDT seems to be wall paint. Since flies, mosquitoes and other domestic pests need only to touch it with their feet in order to pick up enough to kill them, a DDT-carrying painted surface turns the whole interior of a room into a big death-trap for them. Several well-known commercial firms are already manufacturing DDT paints.

Such paints are effective only as long as their surface remains clean. Coatings of dirt or grease form protecting layers between the poison and the feet of the insects, causing loss of killing potency. Paints that tend to scale or crumble a little, thereby automatically keeping fresh surfaces exposed, promise to be especially good as DDT carriers.

DDT stays good indefinitely, either in pure crystal form or in the various solutions in which it is marketed.

ITEMS

TELEGRAPH, telephone and other wood poles will soon have to comply with standard specifications prepared recently under the leadership of the American Standards Association at the request of the Government. The prime purpose of the job will be to conserve natural timber supplies, and secondly to channel the production and use of poles so that all users will have a fair share of the available timbers. "War needs have depleted our timber supply to an extent that we do not yet fully realize," according to Dr. R. H. Colley, of Bell Telephone Laboratories. Civilian use of poles was cut in half during the war, leaving a big pent-up demand now that restrictions are removed. It is estimated that at least 4,000,000 poles a year during the next few years will be required. The new specifications will cover wood poles from jack pine, red pine, western white pine, inland types of Douglas fir, western hemlock, western larch and certain miscellaneous species. The specifications will aim at treatment of every pole with wood preservatives so that the poles will last as long as possible. The specifications, also, will cover prohibited and permitted defects, such as sap stain, twist grain, insect damage, knots and scars. Such matters as manufacturing, dimensions, storage and handling will be covered.

MORE durability and sightly finishes for household refrigerators, stoves and other equipment are promised with new synthetic, exceptionally hard, stainproof enamels developed here by the Arco Company and already in production. They will be known as synox finishes. One type of the new enamel is designed for such articles as refrigerators, stoves, ironers and electric mixers, and another for dishwashers and washing machines. Laboratory and practical tests show that they have an unusual degree of water and alkali resistance, it is claimed, also resistance to stains and change of color. The new material has been successfully applied to clean steel, with or without primer, and to aluminum and magnesium. Despite its hardness, synox has a flexibility which is more than ample to meet all service conditions.

SCIENCE NEWS

Science Service, Washington, D. C.

PROTECTION FROM ULTRAVIOLET LIGHT

WELDERS and their helpers, skiers, flyers and sunbathers may need more eye protection from ultraviolet light than has previously been supposed, it appears from studies reported by Dr. Ernest Wolf, of the Harvard Biological Laboratories, to the National Academy of Sciences.

The danger of "snow-blindness" among skiers and Arctic explorers and of eye damage among persons exposed to invisible ultraviolet light on their jobs is well known, Dr. Wolf points out. He has found, however, that more of the ultraviolet is dangerous than had previously been supposed.

Ultraviolet light is invisible and consists of light waves shorter than those that give visible light. Visible light starts with waves 400 millimicrons long and goes on to waves 750 millimicrons long. Short might seem a better way of describing their length since one millimicron is only 1/25,400,000 of an inch.

The waves of ultraviolet light are all shorter than 400 millimicrons, but scientists have heretofore thought that ultraviolet between about 300 and 400 millimicrons in length did not harm the eyes. Dr. Wolf's studies, sponsored by the American Optical Company, show that ultraviolet ranging in wavelength from 300 to 365 millimicrons can damage visual function even though the eyes themselves show no injury.

His studies were made with baby chicks, since their eyes are very similar to human eyes and since the chicks will keep their eyes wide open during exposure to ultraviolet light. Tests on human eyes could not be made because of the possibility of damaging the eyes.

The chicks were first exposed to ultraviolet light from a quartz mercury lamp for an hour. The lights were then switched off and the chicks left in complete darkness for an hour. This would have been more than enough time for their eyes, if unaffected, to have become adapted to the dark and their visual functions would have been normal.

The chicks were then placed in individual glass jars, each jar surrounded by a glass cylinder bearing alternate transparent and opaque vertical stripes. The stripe system moved at a given rate and produced flicker to which the chick responded by jerky head motions. The experiment determined the intensity of light needed for flicker recognition.

In comparison with unexposed chicks, the test chicks, due to ultraviolet injuries, required 45 times as much light to recognize the flickering stripes. Not until three days later could their eyes see normally again. By shielding the ultraviolet lamps with protective glass filters that cut out the invisible ultraviolet light at about 365 millimicrons and below, it was discovered that the eyes of chicks exposed to the filtered light functioned normally.

The lamps were then shielded with a series of less efficient glass filters that cut out shorter ultraviolet radiations. Repeated experiments with these filters revealed that ultraviolet below about 365 millimicrons impaired visual functions in varying degrees depending on the wavelength transmitted.—JANE STAFFORD.

ITEMS

A PROJECTED image on a screen showing defects in the electrical system of aircraft engines is one of the outstanding features of the new ignition analyzer developed by D. Napier and Son and the English Electric Company. About the size of a portable typewriter, the analyzer, taking power from 220 volt A.C. mains or a 6, 12 or 24 volt accumulator, may be adapted as a permanent instrument on multi-motored planes. Peaked figures on the screen, one for each spark plug, arranged in the firing order of the engine, remain unchanged in shape and intensity when the ignition system is functioning properly, but flicker and alter shape in direct ratio to defects in corresponding spark plugs. Easily diagnosed by visual characteristics of the fault, excessive spark gaps give a high figure, short-circuited gaps a correspondingly low figure, while an occasional miss shows instantly as a definite flicker. Defects in the magneto or distributor alter the entire row of figures as a unit. By locating and diagnosing minor defects, dormant until the moment of breakdown, this tester can minimize loss of flying time and aid maximum engine efficiency. Operated in flight, potentially serious engine failure due to faulty ignition may be revealed, giving the pilot adequate time to find suitable terrain should a forced landing be necessary.

WOOD ducks in considerable numbers were made sick, and many of them died, after breathing clouds of spores given off by a mass of moldy corn on which they were feeding, in a flooded area near Havana, Ill., it is reported in *The Journal of Wildlife Management*. Dissection of several of the dead birds showed their lungs and other organs in the upper parts of their bodies to be overgrown with a growth of white mold, which was identified as Aspergillus fumigatus—a botanical second cousin of the mold from which penicillin is extracted. Eating the moldy corn seems not to have caused the ducks any direct injury. It seems more probable that the microscopic propagating bodies, or spores, stirred into the air as the ducks were trampling in the spoiled grain, were breathed into their lungs and germinated there, producing effects like those of pneumonia. A search of the records for similar cases disclosed a number of isolated instances, in which gulls, owls and other bird species besides ducks were the victims. A disease called brooder pneumonia, said to be well known to breeders of chickens, ducks and ostriches, is blamed on the same kind of mold. Investigators of the present outbreak were Frank C. Bellrose, Jr., and Harold C. Hanson, of the Illinois Natural History Survey, and Dr. P. D. Beamer, of the University of Illinois.

SCIENCE NEWS

Science Service, Washington, D. C.

THE 25TH ANNIVERSARY OF RADIO BROADCASTING

RADIO broadcasting is now twenty-five years old as an American system and its silver anniversary will be celebrated by a National Radio Week, beginning on November 4. The week is sponsored by the National Association of Broadcasters at Washington, D. C., in cooperation with the four major networks and the Radio Manufacturers Association.

The first regularly scheduled broadcast, it is claimed by Westinghouse Electric Corporation, was a report of returns of the Harding-Cox presidential election on November 2, 1920, presented on its Pittsburgh station.

The year 1920 does not mark the discovery of radio or of radio broadcasting, but it is the date of the origin of the American broadcasting system. Experimental licenses were granted as early as 1916, but they were for stations experimental in character. In 1920, radio broadcasting ceased to be an experiment and became a permanent adjunct to American life.

The first radio broadcast in history, it is claimed, was on Christmas eve, 1906, from the Fessenden station at Brant Rock, Mass. Morse-code radio operators on vessels at sea were among those who picked up the human voice from the air, very much to their surprise, instead of the familiar dots and dashes.

Professor Reginald A. Fessenden was one of the pioneer radio experimenters. This first broadcast was made possible by the development of the high frequency alternator by Dr. Ernst F. W. Alexanderson, consulting engineer of the General Electric Company, who earlier this year was the recipient of the highly prized Edison Medal for 1944, awarded to him for this and other outstanding radio and electronic discoveries.

During radio week, broadcasters, equipment manufacturers and others identified with the American system of broadcasting will tell the public the meaning of this kind of broadcasting, how it came into being, its position in local and national affairs in war and peace, its role as a guardian of free speech and its contributions to the welfare of the nation and to individual citizens.

ITEMS

A NEW restoration of the skull of an ancient animal intermediate in physical characteristics between a man and an ape shows it to have been less ape-like, more man-like, than preliminary studies indicated. The creature, called Plesianthropus (Greek for "almost man"), represented thus far by skull fragments, brain cast and a few teeth, was discovered near Johannesburg, South Africa, by Dr. Robert Broom, well-known anthropologist who has done much work on the fossil primate remains of that region. The present restoration, made by Dr. William K. Gregory and Dr. Milo Hellman, of the American Museum of Natural History, is not intended to be the final one: too many parts are still missing. But so far as it has been made, on the basis of casts and minutely detailed measurements sent to this country by Dr. Broom, it takes an intermediate position between apes and men. Details regarding the new restoration are published in the *Journal of Physical Anthropology*.

THE speed of the baseball between the pitcher's hand and the catcher's mitt needs no longer be a guess; it can be measured, and timed accurately down to a ten-thousandth of a second. Electronics is the answer; a versatile electronic device does the job. The same device can measure the speed of the shutter on a camera or the rate of travel of a bullet from a rifle. In measuring the speed of a moving body, two photo tubes with light sources aimed on them are set up with a known interval between them and directly in the line of flight of the moving object. The light sources shining on the photo tubes create two beams of light. A meter begins timing when the moving object breaks the first beam of light and ceases timing when it breaks the second. It records the time in thousandths of a second. In measuring shutter speed on a camera, the time interval meter clocks time consumed by one shutter operation at any speed setting. A photo tube picks up light and transposes it to voltage pulse first when the shutter opens and again when it closes. The dial records the interval. This measurement is taken without any mechanical attachment to the camera which might retard its movement. The device was used during the war to determine time interval in checking high-speed aerial cameras.

MANY species of Pacific island birds may become extinct because of military occupation, report Dr. Harvey I. Fisher, ornithologist of the University of Hawaii, and Paul H. Baldwin, U. S. National Park Service, who recently completed a survey of birds on Midway Island. Two species of birds formerly plentiful on Midway already most likely have become extinct, Dr. Fisher and Mr. Baldwin state. The Laysan rail and the Laysan finch, both of which were plentiful on Midway in 1941, have probably been wiped out. The only other known habitat of these species is Laysan Island in the Midway group, from which both are believed to have disappeared some years ago. Other birds, though perhaps not so rare, have also suffered. The "gooney bird," or Laysan albatross, has been reduced to less than half its estimated 1941 population. Whereas there were half a million Bonin Island petrel in 1941, the present population is estimated at 25,000. Only three noddy terns were found on Midway, where 2,000 were believed to exist before the war. The importation by military shipping of rats which kill off birds; use of large areas for buildings, lawns and walks, eliminating vegetation and cover; and unavoidable slaughter of birds by planes landing and taking off are some of the reasons why military occupation of an island is devastating to bird populations. In addition, birds are unavoidably trapped in barbed wire, old gun emplacements and fox-holes. Bird eggs are also collected for eating.

SCIENCE NEWS

Science Service, Washington, D. C.

RECORDS OF STORMS WITH RADAR EQUIPMENT

RADAR instruments developed for war purposes may play an important part in future weather forecasting and also make permanent records relative to the nature of storms and their movements for use in the science of meteorology. The entire progress of the recent September hurricane in its gradual curve up Florida was accurately plotted on film near Orlando, Florida, by Army radar war equipment. Photographs of each radar scope were taken each 15 seconds by electrically operated cameras.

The use of radar to detect storms began at least as early as August, 1943. Before that, Army radar technicians had noticed "ghost echoes" on their relatively primitive scopes but did not realize at first that they were caused by thunderstorms. Later they did, and Army weather observers soon learned how to use radar to plot other storms and they later developed better techniques of detection. But the size and violence of the storm of September 15, and its closeness to the radar station, resulted in new findings about the nature of hurricanes.

Throughout the hurricane the general shape of the disturbance was plainly seen on the micro-wave set, whose energy was reflected excellently from the rain carried by the storm. The storm was seen to be in the shape of a figure six with clockwise spiralling tails. At one time six distinct tails were observed, three of which were detached and were moving northward ahead of the storm's center. These tails were deduced to be rain-bearing storm clouds, or line squalls eight to ten miles in width and from three to five miles apart.

When the hurricane was abreast of the radar station, and only 10 miles away, the radar revealed that the eye of the storm, the low pressure area in its center, was 12 miles in diameter, and the lack of echoes proved that there was no precipitation within it. The height-finding radar set revealed that the dense cloud deck surrounding the eye extended up to an average height of 18,000 feet.

RADIO-TELEPHONE CIRCUITS

RADIO-TELEPHONE circuits permitting 24 two-way simultaneous conversations on a single radio-frequency carrier wave, have just been successfully demonstrated here at the headquarters building of the International Telephone and Telegraph Corporation, New York City, when two groups of twenty-four men in separate rooms conversed at the same time, the conversation passing through relay stations at Hazlet and Nutley, N. J.

The experimental network utilizes the pulsetime modulation principle of transmission recently perfected by the Federal Telephone and Radio laboratories and other laboratories of the corporation after nine years of research. Only one transmitter and receiver are required at each location for the 24-channel simultaneous communication.

Common waveguides and antennas are used both for transmission and reception: parabolic reflectors, eight feet in diameter, serve to beam the 1,300 megacycle carrier. The reflector at the New York end is located on the roof of the thirty-five-story International Telephone building, those at the two New Jersey relay stations are on high towers.

The present twenty-four-channel arrangement makes use of a combination of pulsetime modulation plus a system of electronic time selection, certain fractions of each second being allotted each channel for the transmission of its signal. In contrast to mechanical systems evolved in the past, the method of time selection used is entirely electronic in operation, and was developed especially for this purpose.

It permits 24-channel voice communication with all the fidelity of modern telephone standards, it is claimed, and is much more compact than equipment designed for frequency selection.

ITEMS

THE discoverer of the planet Pluto, Clyde W. Tombaugh, is to be visiting assistant professor of astronomy at the University of California at Los Angeles. During the term beginning on October 26 he will give classes in celestial navigation, an essential part of air navigators' training, as well as in elementary and stellar astronomy. Mr. Tombaugh was a young assistant at the Lowell Observatory at Flagstaff, Ariz., when he discovered the ninth major planet in the solar system. Subsequently he was first holder of the Slosson scholarship at the University of Kansas, founded in memory of Dr. Edwin E. Slosson, first director of Science Service. Mr. Tombaugh received his bachelor's degree there in 1936, and his master's degree in 1939. In recognition of his discovery of Pluto, he was awarded in 1931 the Jackson-Gwilt medal of the Royal Astronomical Society.

THE New Guinea Shangri-La or Hidden Valley, from which three survivors of a plane crash were rescued by glider plane during the past summer, is now identified as the Grand Valley of the Balim River discovered and explored in 1938 by a combined American and Dutch scientific expedition organized and led by Richard Archbold, of the American Museum of Natural History. The identity of the valley came about through a comparison of photographs taken by the Army just before the survivors were rescued with airplane photographs taken by the Archbold expedition. The identity is acknowledged by the Army, and particularly by Colonel Ray T. Elsmore, who directed the recent rescue operations. Early in the exploration of the Grand Valley by the Archbold expedition it was found that their flying boat could be landed near the lower end of the valley. A base camp was located there, supplies were flown into this landing place, and from it the whole party of nearly 100 men was flown out of the valley when its work was done.

SCIENCE NEWS

Science Service, Washington, D. C.

THE NEW ELECTRONIC DIFFERENTIAL ANALYZER

THE mathematics that the engineers of the future are likely to use is expected to come out of the research to be done with the new electronic differential analyzer of the Massachusetts Institute of Technology which has just been released from war to peacetime work.

This new mathematical robot, with 2,000 electronic tubes, several thousand relays, 150 motors and nearly 200 miles of wire in its mechanical "brain," has worked on the development of radar theory, computing range tables for the U. S. Navy guns and other war tasks.

Now it is to be used on an equally important job. It is free to turn to the task for which it was designed—creating the groundwork for the mathematics of the future.

The mathematics currently used in physics and engineering applications has been devoted to the solution of what mathematicians call "linear" problems, but it has become increasingly evident that the usefulness of these methods has been almost exhausted. They will still constitute the major body of information in handling routine problems.

But the new problems in physics, electrical engineering, aerodynamics, and similar fields seem to be primarily non-linear. Leading mathematicians admit that their principal handicap in handling such problems is that they just don't know enough about the nature of solutions to these problems to make intelligent guesses as to what they are like. From the mathematician's point of view, the major contribution of the differential analyzer and similar computing machines will be to provide the "horse-work" to build up an immense number of detailed numerical solutions to non-linear problems so that the form or shape of the general solutions will become intuitively familiar.

To solve new problems, a mathematician must develop a feel for what the solution will be like. The computing machines of the future must provide a skeleton outline of the new mathematics as a framework for the mathematician to construct theories which the physicist and the engineer require.

Scientific announcement of the differential analyzer has just been made in the Journal of the Franklin Institute in a joint paper by Dr. Vannevar Bush, formerly vice-president of the Massachusetts Institute of Technology, and now president of the Carnegie Institution of Washington and director of the Office of Scientific Research and Development, and Dr. Samuel H. Caldwell, director of the Institute's Center of Analysis.

ITEMS

A NEW oil exploration and production research center, to be devoted to studying new methods of finding oil and getting it out of the ground, will soon be built in Houston, according to officials of the Shell Oil Company. The million-dollar research center is expected to be completed by spring. It will house the company's recently organized division of exploration and production research, an independent entity within the Shell organization. The research program of the new laboratory will focus attention on augmenting America's petroleum resources by developing new and more efficient methods for discovering oil and for recovering it in quantities from the underground reservoirs in which it is found. The discovery of new reservoirs is becoming increasingly difficult and large quantities of oil in present reservoirs are not being brought to the surface by present production methods, oil experts agree. Research in physics, chemistry and geology, as they relate to petroleum exploration and production, will be carried on at the laboratory. It will also serve as an instruction center for training exploration and production field men in new techniques and methods. Director of the new division is Dr. Harold Gershinowitz, who for the last few years has been research director of the company's manufacturing department in New York.

THE shell of the average hen's egg has about 8,000 pores or tiny holes in it. However, there is a great variation in the number and size of these pores. The best egg shells are the ones with a large number of small pores—so small that the escape of gases is difficult and evaporation is slow. Poor shells have fewer pores, but several large ones that make evaporation more rapid. Investigators at several experiment stations have demonstrated that these differences in shell quality are inherited. Dr. A. L. Romanoff of the poultry department at Cornell University has made a detailed study of porosity in eggs and points out that eggs with poor quality shells lose quality much more rapidly than do those with good shells. This, he says, is particularly important at this time since greater attention is being paid to egg quality. Workers in the U. S. Bureau of Animal Industry at Beltsville found that more broken eggs occur among those with poor shell quality. However, by using the progeny test method of breeding, they were able to improve egg shell quality considerably. Hens were selected as breeders whose eggs showed the least egg weight loss during the first 14 days of incubation.

CAFFEINE, that causes the stimulating effect in coffee, tea, soft drinks and certain medicines, will soon be in production synthetically in St. Louis in a vast plant to be constructed by the Monsanto Chemical Company. Domestic production of this synthetic caffeine will free the United States from dependency on foreign-produced natural sources. Although scientists have long known how to duplicate the natural product's complicated molecular structure in the laboratory, caffeine until now has been derived almost exclusively from such sources as tea waste and surplus coffee, or indirectly from cocoa cake, a byproduct of chocolate manufacture. The new plant will use a new process, details of which are not revealed, except that the synthetic material, simulating the process of nature, will be derived from nitrogen from the air and hydrogen from water.

SCIENCE NEWS

Science Service, Washington, D. C.

THE SUN'S RADIATION AND THE WEATHER

WEATHER changes on earth may be indirectly controlled by changes in the sun's radiation, through variations in the thickness of the radio-wave-reflecting "E" layer of the earth's outer atmosphere. A close correlation between thickness changes in this layer and shifts in the weather has been found by Dr. Charles G. Abbot, research associate of the Smithsonian Institution, in a study of records extending over seven years.

Dr. Abbot has for many years followed the apparent connection between the weather and the solar constant, or total radiant energy received from the sun, as recorded daily at Smithsonian observatories in California, New Mexico and Chile. Changes in the solar constant are small and difficult to make at best—impossible under bad weather conditions. "E" layer thickness variations, on the other hand, are easier to measure and observations are not affected by weather. These thickness variations are also measured daily, by observers of the Carnegie Institution of Washington; the best records are those kept by the Carnegie stations in Huancayo, Peru, and Watheroo, Australia.

"It is clear," according to Dr. Abbot, "that the sun's variations are a major factor in weather. The effects produced are large. In Washington temperatures it makes nearly 20 degrees Fahrenheit of difference in some months whether the solar constant rose or fell by three fourths of one per cent. a week or more previously. The effects are long continuing. They appear to begin three days before measurable changes in radiation occur, and to last at least until fourteen days after, making an important sequence of at least 17 days in weather, attending each change of solar radiation.

"It appears that approximate predictions a week in advance could be made of dates of peaks and troughs of Washington temperature if daily reports of the 'E' layer were obtained from a sufficient number of ionization stations, and if means could be found to anticipate by a few days closely the date of the next approaching solar change. Its sign would always be known to be opposite to that last observed. From present records we should expect solar changes of the same sign to follow each other at intervals of about nine days, with changes of opposite sign intervening. There is, I think, a fair hope that such important dates as heavy frosts may become predictable a week in advance from solar observations by this method."

ITEMS

THE Smyth report on atomic energy, which is the authorized detailed story of the development that led to the atomic bomb, has been reprinted in a 10,000-edition by His Majesty's Stationery Office, the official British government agency corresponding to the U. S. Government Printing Office which prints U. S. official publications. About ten such U. S. documents have been preprinted similarly, including the official radar report. The American Library in London, which is a function of the Department of State, acts as professional adviser to the HMSO in this connection.

RETURN of science in Norway to normal conditions is signalized by arrangements now being made for a geological research expedition into a high mountain area in the central part of the country, to study records left in the rocks and soil by the waning remnants of the last great Ice Age glacier. A communication to this effect has just been received here by the Geological Society of America from Dr. Kaare Munster Strom, president of the Geological Society of Norway. The expedition, which will be in the field from about June 25 to July 5, will be under Dr. Strom's leadership. The size of the party will have to be limited because of lack of shelter in the rugged mountain country, but two or three American geologists may be included.

A SHIPMENT of 800 fingerling carp has been sent by the U. S. Fish and Wildlife Service to stock lakes and streams in the neighborhood of the American air base on Trinidad, off the northern coast of South America. The carp is an exceedingly adaptable and prolific fish, and even a small planting like this has a good chance of becoming established. Introduced from Europe, the carp has never found much favor in this country. It is close to the bottom of the American market in order of preference as a food fish, and sportsmen generally consider it a pest. One virtue is grudgingly conceded to it: carp will survive in waters too polluted for any other species. Yet many peoples elsewhere in the world are very fond of it, and it has a long and honorable table history. Roman patricians used to have private carp ponds at their country villas, so that the fresh-caught fish could be carried directly to the kitchen.

A NEW industrial science research center under construction at Bound Brook, N. J., is another bit of evidence of appreciation by American industrialists of the part science played in winning the war, and the increasingly important part scientists will play in American manufacturing. The building under construction is the first unit of a gigantic center to carry on research work in the field of building materials. It is being erected by the Johns-Manville Corporation. A unique feature of the first building of the group planned, a $2,000,000 structure, is that it will contain central laboratories and ten experimental factories. Projects initiated in the laboratories may thus be carried through their development and pilot-plan production stages under one roof. This is expected to speed up the development of new and improved materials for building and for industrial uses. The completed research center, if constructed according to present plans, will include six buildings on a 93-acre plot, across the Raritan River from the company's plant at Manville. They include two laboratory-factory structures, a research engineering and machine shop building, a water-filtration and waste-processing building and utility buildings.

SCIENCE NEWS

Science Service, Washington, D. C.

INFLUENZA VACCINE

INFLUENZA vaccine of the kind now being given to all Army personnel will be available for civilian use by December 1 or shortly after.

The vaccine is effective against Types A and B influenza. These are the types which have caused epidemics in recent years. Other types of influenza virus exist. Authorities do not know whether the world-wide influenza epidemic in 1917–1918 was due to A or B virus or to some other type.

Army studies, prior to the general vaccination order, showed that about 75 per cent. of those vaccinated were protected against influenza during outbreaks which occurred soon after the vaccination. How long the immunity, or protection, lasts is not definitely known.

The vaccine is given by hypodermic injection under the skin of a single dose of one cubic centimeter (about one fourth of a teaspoonful).

Civilians whose physicians advise them to be vaccinated will find that the vaccine is expensive. Actual manufacturing costs are about 50 cents to one dollar per dose. Retail costs may be three to five times as much.

The vaccine is made from influenza virus grown on chick embryo. The following firms have been manufacturing the vaccine: Lederle, Squibb, Sharp and Dohme, Lilly, Pitman-Moore and Parke-Davis. Some manufacturers have already applied to the National Institute of Health for licenses to manufacture the vaccine for civilian use. Others will doubtless make similar requests soon and it is expected that firms which have not yet made the vaccine may do so in the future.

Influenza at present shows no signs of becoming epidemic this winter. Cases reported to the U. S. Public Health Service since January 1 total about 85,000 compared to some 350,000 for the same period last year. Some widely scattered small outbreaks last spring led Army medical officers at that time to anticipate an epidemic this winter. Although it has not yet materialized, the possibility at that time led to plans for vaccination of all personnel as soon as sufficient vaccine was available. By October there was enough of the vaccine to order general vaccination during October and November.

ITEMS

THE formation of an interim educational, scientific and cultural commission, consisting of the representatives of 15 governments, to bridge over the gap until a United Nations Educational, Scientific and Cultural Organization is fully established has been suggested by the United States delegation to the organization meeting of the UNESCO in London. Another interim commission to examine the problem of controlling atomic research was proposed by the Belgian representatives. Professor G. Magnel, civil engineer from the University of Ghent, states that the Belgian proposal would involve the inspection of all nuclear research laboratories by an inspection service to be set up by each government, which would then report its findings yearly to UNESCO.

NEW treatments for disease are hoped for through use of plants and herbs expected to be discovered by a Soviet medical expedition in the mountainous Altai region of central Asia. The sending of several expeditions to this area has been announced by the U.S.S.R. Academy of Medical Sciences through its secretary, Professor V. V. Parin. Other inquiries under way include a survey of the health conditions in the regions that were occupied by the Nazis. In all, 30 medical expeditions are in the field.

A MODEL of an engine, claimed to be the simplest engine in the world to-day, was demonstrated recently at the Polytechnic Institute of Brooklyn by Zygmunt Fonberg, the Polish rocket expert and inventor of the first bazooka in Poland prior to the war. It is a ram jet motor of new and unusual design. This new engine was designed to help launch gliders into the air. It consists of a cylindrical tube, which appears to be just an empty pipe, mounted on a restraining structure which has a free moving arm to permit the engine to swing in a circle around it when in operation. The lining of the tube expands from a smaller diameter in the front end to a larger diameter at the other end. The space on either side of the lining and the outer wall contains the gas which runs into a nozzle at the forward end of the cylinder. Air mixes with the gas coming through the small holes of the nozzle during combustion, thus providing the force of propulsion.

IN Soviet Russia, 3,900 scientists were graduated from the colleges with the degree of doctor in the years 1937 to 1944; about 20,000 received a master's degree, according to Joseph Agroskin, vice-chairman of the Committee on Higher Education in Moscow. The Soviet Government has been paying particular attention to the matter of training scientists because of the pressing need for teachers of technical subjects in the colleges due to greatly increased student body. In 1929, there were only 26,000 engineers with diplomas in all the heavy industries of Russia. But in the last six years, about 80,000 engineers were graduated. In pre-revolutionary Russia, Vice-Chairman Agroskin said, higher education was for the privileged few of the upper strata. In 1914, Russia had only 91 colleges with 112,000 students. The Soviet Government placed the entire system of higher education on new principles. Nationality and class distinctions were abolished. Education was free. All nationalities were permitted to teach in their own languages in colleges on the territory of their own national republics. Both universities and institutes were opened to all working people. As a result, there are now 772 colleges with 562,000 students. Of these 132 are industrial institutes, 18 transport institutes, 87 agricultural institutes, 68 medical institutes, 115 pedagogical colleges and 29 universities. In 1925, Vice-Chairman Agroskin reported, there were only 17,900 professors and lecturers in all Russia's colleges. Now there are 40,000.

SCIENCE NEWS

Science Service, Washington, D. C.

ARTIFICIAL SUNLIGHT

IT takes a mixture of lights from various types of electric lamps, plus water-screening, to make artificial sunlight that duplicates the real thing, according to the illumination engineers of the General Electric Company. They have succeeded by using a combination of fluorescent lamps, mercury lamps, sun lamps and incandescent lamps. The light from two sources was "treated" by passing through a sheet of water.

First the composition of solar energy using the latest developments in the field of illumination was studied, measurements of sunlight, analysis of its characteristics and the intensity of each spectral band of solar energy being made. Then scientific knowledge of the radiation from various lamps to develop a combination to duplicate the light from the sun was applied.

To test the conclusions, a dark room the size of an ordinary office was selected. Light from six 3,000 watt mercury lamps and 234 incandescent reflector lamps of the 300-watt type was directed into the room through a wire glass ceiling, over which drifted a continuous sheet of water.

Absorption of some radiation by the water prohibits certain spectral bands of solar energy from passing through the glass ceiling, this action causing distribution of resulting radiation to be similar to that of sunlight. The system thus takes into account selective absorption of certain radiation by water vapor in the air.

On other sections of the ceiling was a row of 275-watt sun lamps and several rows of 100-watt fluorescent lamps. The sun lamps produce a tanning effect. A fan was installed to draw off part of the heat of the fluorescent lamps through perforations in the ceiling. This heat elimination, coupled with the heat dissipation caused by the continuously flowing water, permitted an abundance of infrared rays to be radiated into the room.

The total result of the combination of lamps and the special arrangements was a light closely approaching actual sunlight in characteristics and intensity. Householders need not anticipate lighting their homes with this artificial sunlight as yet—it required as much electrical power for this single G-E room as is ordinarily required to light a hundred houses.

ITEMS

IN the proposed support of research with Federal funds now being considered by Congress, investigations by government agencies themselves should have their place in the sun, it was pointed out by Dr. Lyman J. Briggs, retiring director of the National Bureau of Standards, at the annual meeting in New York City of the American Standards Association. He stated that the Magnuson bill now in the Senate committee was written primarily around the idea of providing federal funds to universities: that the Kilgore and Fulbright bills provide for the participation of government agencies also in the enlarged research program and that scientific research by government agencies and basic research in particular has not in the past had much support in congressional circles. He hoped that the greater interest now being shown in research would provide a place in the sun also for the old-line government research agencies and that they may have the opportunity to show what they can do with adequate support. He believes that research by industry should be encouraged in every way possible, including tax exemptions or similar indirect subsidies.

THE "electronic blanket" is in reality an electrically heated bed blanket with an electronic device to control its temperature. The new blanket and control were demonstrated recently by the Simmons Company, its producer. The control is centered in a small instrument in an attractive case placed beside the bed within reach of the occupant. The heating electric current passes through the case. Three electronic tubes within it determine the amount of current passed, and these are affected by the heat of the blanket. Within the blanket is a small flexible cable consisting of two parallel conductors. One of the conductors serves as a heating element, the other is the temperature control or "feeler" wire. When the temperature of the blanket goes above or below the temperature set on the control device, this feeler wire sends electronic impulses to the control which automatically regulates the amount of current sent through the heater wire.

WHIRLING airplane propellers appear to stand still when viewed through a new optical instrument developed by The General Electric Company. It is known as a Rotascope, and is said to be an optical system of untwisting the light of rotating objects before recorded by the human eye. It is claimed to be the first instrument of its kind which allows a continuous viewing of a rotating object at any particular point in its path of travel. While it eliminates the rotary component of a whirling object's motion, it does not eliminate any flutter or vibration of the moving part. In this is its primary value—by its use scientists are able to make a thorough study of the rotating parts of machinery.

SPARKPLUGS with electrodes that grow with use instead of wearing away and a new airplane ignition system for high-altitude flying are recent contributions to aviation developed by the electrical engineering department of Yale University. The life of the sparkplugs is considerably lengthened by the development, and in the new ignition system they are fired by radio frequency currents. The special electrodes with which the sparkplugs are equipped grow in physical length as they are used, by approximately the same amount that the ordinary electrodes wear away. This keeps the spark gaps more nearly constant and doubles the length of life of the plugs. The principal feature of the new ignition system is the use of high-frequency currents to fire the new sparkplugs. The two developments constitute a valuable combination in planes, particularly at extremely high altitudes. They were developed at Yale University by Gregor Lang, of the American Bosch company.

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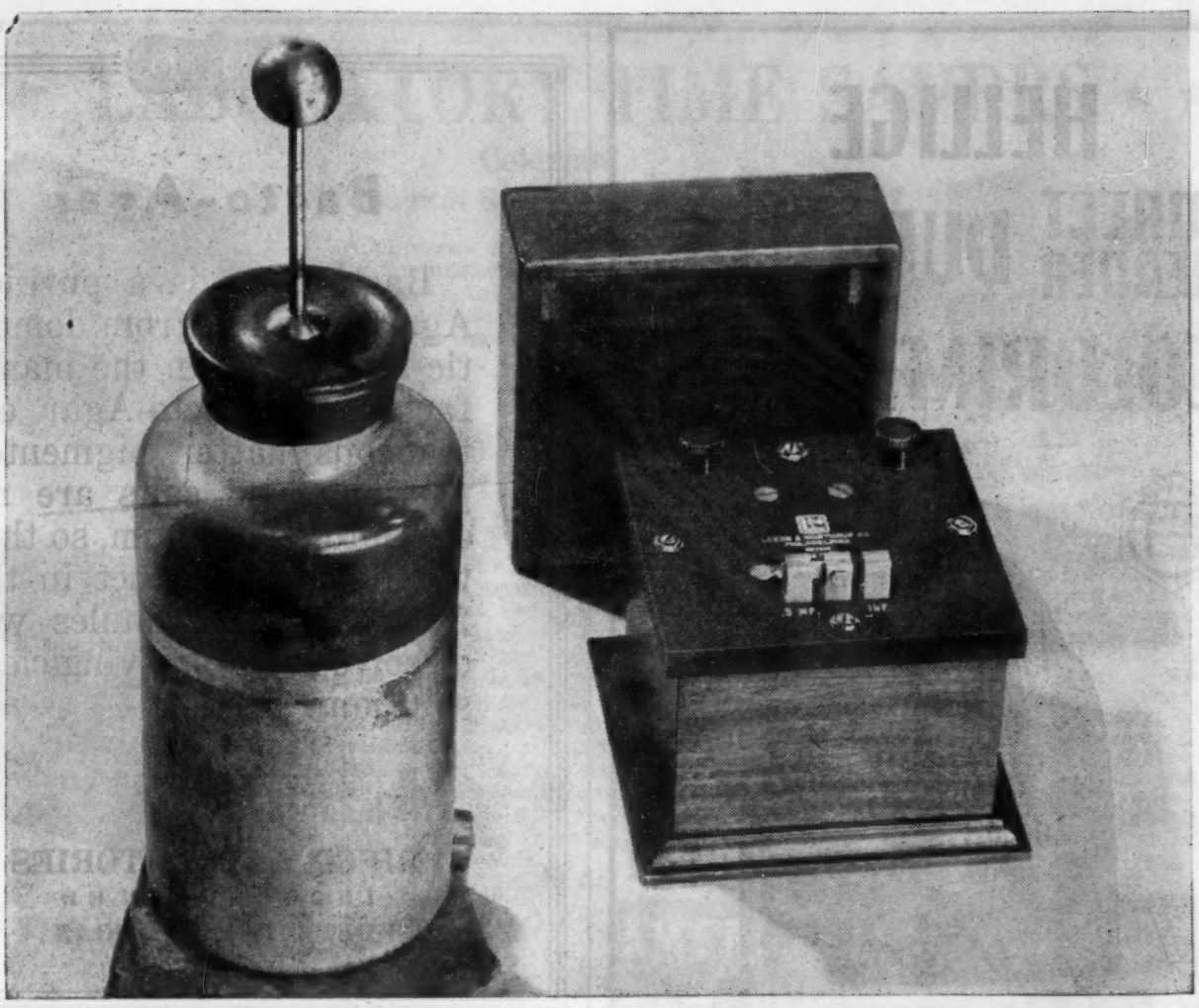

(Courtesy of Franklin Institute)

Leyden jar of Benjamin Franklin's day, compared with an L&N 0.5 μf mica capacitor.

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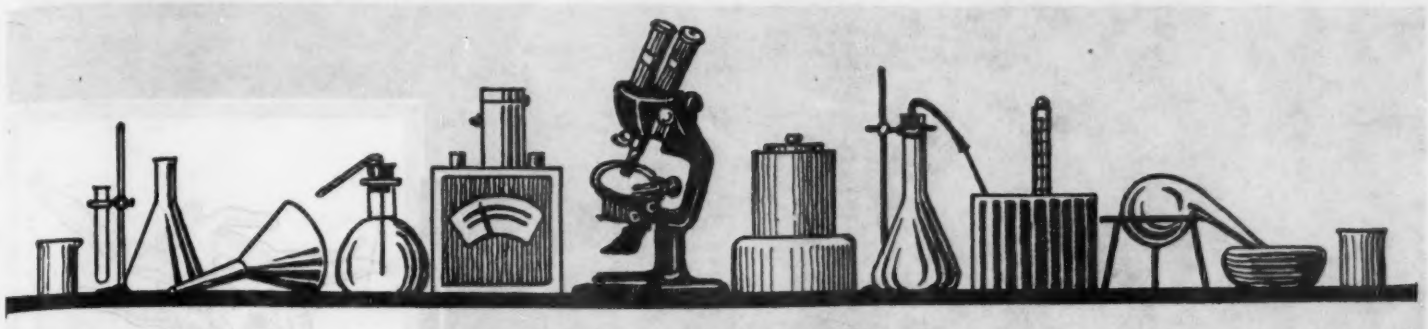

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